

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE <div style="text-align: center;">J</div>		PAGE OF PAGES <div style="display: flex; justify-content: space-between;"><div>1</div><div>2</div></div>	
2. AMENDMENT/MODIFICATION NO. <div style="text-align: center;">0002</div>		3. EFFECTIVE DATE <div style="text-align: center;">21-Nov-2002</div>		4. REQUISITION/PURCHASE REQ. NO. <div style="text-align: center;">W26GLG-2253-0526</div>		5. PROJECT NO.(If applicable)	
6. ISSUED BY <div style="text-align: center;">CODE</div> CONTRACTING OFFICE (CA/CW) US ARMY ENGR DIST NORFOLK ATTN: CENAO-SS-C 803 FRONT STREET NORFOLK VA 23510-1096		DACA65		7. ADMINISTERED BY (If other than item 6) <div style="text-align: center;">CODE</div> <div style="text-align: center; font-weight: bold;">See Item 6</div>			
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				X		9A. AMENDMENT OF SOLICITATION NO. DACA65-02-R-0044	
				X		9B. DATED (SEE ITEM 11) 01-Oct-2002	
						10A. MOD. OF CONTRACT/ORDER NO.	
						10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input checked="" type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required)							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) AMENDMENT NO. 0002 TO DACA65-02-R-0044, F-22 APRON, LANGLEY AIR FORCE BASE, VA.							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				TEL: _____ EMAIL: _____			
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED 21-Nov-2002	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

The following items are applicable to this modification:

CONTINUATION

1. PHASE II PROPOSAL S ARE DUE DECEMBER 20, 2002 AT 2:00 PM, U.S. Army Engineer District, ATTN: CENAO-SS-S, 803 Front Street, Norfolk, VA 23510-1096.
2. SECTION 00100: ADD the attached Bidding Schedule.
3. SECTION 00800, FAR 52.211-10, Liquidated Damages, ADD: "\$1,299.00".
4. Technical plans and specifications are amended. Make appropriate changes in accordance with the attached.

Section 00010 - Solicitation Contract Form

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001	SCHEDULE I - BASE FFP PURCHASE REQUEST NUMBER: W26GLG-2253-0526		Lump Sum		

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001AA	FFP All construction work on Base Bid, complete, including all work incidental thereto as shown on the drawings and as specified, exclusive of items 0001AB-0001AC, and Schedule II-Optional Bid Items.	1	Lump Sum		

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001AB		1	Lump Sum		

FFP

All costs in connection with new concrete pavement in Base Bid, complete, including compacted subgrade, aggregate base course, and all work incidental thereto as shown on the drawings and specified. Pavement ____sq. yd @ \$____per sq. yd., excluding items 0001AA and 0001AC, and Schedule II - Optional Bid Items.

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001AC		1	Lump Sum		

FFP

All costs in connection with removal and disposal of contaminated soils complete, including all work incidental thereto as shown on the drawings and specified. Soil ____cu. yd @ \$____per cu. yd., excluding items 0001AA-0001AB, and Schedule II - Optional Bid Items

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002	SCHEDULE II - OPTIONAL ITEMS FFP				

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002AA OPTION	FFP All construction work on Optional Bid Item, complete, including all work incidental thereto as shown on the drawings and as specified, exclusive of items 0002AB-0001AC, and Schedule I- Base Bid Items.	1	Lump Sum		

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002AB OPTION	FFP All costs in connection with new concrete pavement in Base Bid, complete, including compacted subgrade, aggregate base course, and all work incidental thereto as shown on the drawings and specified. Pavement ____sq. yd @ \$____per sq. yd., excluding items 0002AA and 0002AC, and Schedule I - Base Bid Items.	1	Lump Sum		

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002AC OPTION	FFP All costs in connection with removal and disposal of contaminated soils complete, including all work incidental thereto as shown on the drawings and specified. Soil _____cu. yd @ \$_____per cu. yd., excluding items 0002AA- 0002AB, and Schedule I - Base Bid Items	1	Lump Sum		

NET AMT

FOB: Destination

52.211-12 LIQUIDATED DAMAGES--CONSTRUCTION (SEP 2000)

(a) If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of \$1,299.00 for each calendar day of delay until the work is completed or accepted.

(b) If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause.

(End of clause)

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SECTION 01005

PROJECT WORK REQUIREMENTS AND RESTRICTIONS

07/00

PART 1 GENERAL

1.1 DEFINITIONS

a. Facility: The facility is Langley Air Force Base, hampton, Virginia..

b. CO: Contracting Officer or his authorized representative.

1.2 COOPERATION WITH USING AGENCY AND OTHER CONTRACTORS

During the period of this contract, other contracts may be in force for the construction of other features of work on or adjacent to the site of work being accomplished under this contract. It shall be the responsibility of the Contractor on this contract to be fully informed of the extent of the limits of work to be performed by other Contractors. Should there be any conflict between these limits, it shall be brought to the attention of the Contracting Officer and the CO's decision shall be final. Also, prior to completion of work under this contract, members of the Using Agency may be performing work or occupying facilities on or adjacent to the area. The Contractor shall arrange his plant and shall schedule and perform this work so as to effectively cooperate with all other Contractors and Government agencies.

1.3 PERSONNEL RESTRICTIONS

Personnel are limited to the immediate site areas and shall not enter buildings or facilities not involved in the work. All employees of the Contractor will be subject to all rules and regulations of the Facility which pertain to personnel. The Contractor shall erect fences and signs as specified and be responsible for the restrictions of all personnel. The Contractor's plans for restricting personnel access to the project site shall be submitted for approval as a part of the Safety Plan (Accident Prevention Plan).

1.4 TRANSPORTATION FACILITIES

The Facility is served by an all weather surfaced road network. Road(s) within the Facility proposed to be used by the Contractor shall be subject to prior approval of the Facility authorities and such roads, if used, shall be maintained throughout construction and shall be restored to as good condition as existed prior to their use. The Contractor shall also construct, subject to approval, such temporary staging and laydown areas, haul roads and bridges as may be necessary for conducting his work. Any such temporary construction shall be removed and the affected area restored to its original condition. All costs for the use of existing transportation facilities, for the construction of temporary facilities, and for maintenance, repair, removal and restoration shall be borne by the Contractor.

1.4.1 Use of Roads

The Contractor shall keep all roads clear of all obstructions and free of

mud and other foreign materials resulting from operations. Contractor to install and use FOD shakers at each access point to base road system and Flight Line Rd. Contractor and his subcontractors, visitors shall drive over the FOD Grate prior to entering base road system. The Contractor's vehicles shall at no time follow a vehicle closer than 50 feet, and all vehicles shall pull off the road and come to a complete stop when meeting emergency vehicles and vehicles with flashing lights. Facility speed limits and traffic controls will be observed.

1.4.2 Road Restrictions

The movement of all vehicles within the Facility shall be confined to the roads designated and shall comply with traffic regulations within the Facility. Contractor and employees must access the base through the La Salle gate Visitors Center. Employers will be issued a Base Pass. Other roads may be used only with the approval of the CO.

1.4.2.1 Cleated Vehicles

Cleated vehicles shall not be moved over surfaced roads.

1.5 COORDINATION IN WORK AREAS

1.5.1 Unoccupied Work Area

The area where the Contractor is scheduled to perform the work will not be occupied during the work, however, the Contractors work activities may affect other area(s) that are occupied. All work shall be in accordance with the Contractor's work plan.

1.5.2 Maintenance of Utilities

Any active utilities, including but not limited to electricity, gas, water, sewer, heating, air conditioning, or any like service, that will require interruption or replacement in any occupied area affected as a result of the Contractors scheduled work activities, shall be temporarily provided by the Contractor at his own expense until the affected service is fully and permanently restored. All temporary method(s) of service replacement the Contractor proposes for use on this contract shall be approved by the Contracting Officer prior to commencing the work. Contractor to tap into exist water main hydrant for vehicle wash down at FOD shaker adjacent to Flight Line Road. Yard hydrant to be freeze proof and winterized.

1.5.3 Hours of Work

The normal work hours for construction shall be from 7:00 a.m. to 5:00 p.m., Monday through Friday of each week. Contractor will be allowed to operate round-the-clock with prior approval by LAFB and COR (24 hours every day of the week). Any request to change these hours shall be made in writing to the Contracting Officer at least two calendar days prior to the desired day on which the change is to go into effect. The changed hours shall not go into effect until written permission has been received from the Contracting Officer.

1.5.4 Digging Permits

AF 103 Digging Permits, must be obtained before doing any work on Post. The Contractor shall be responsible to obtain all necessary digging permits and pay costs associated with the permit.

1.6 INTERRUPTIONS OF UTILITIES

1.6.1 Approval

Utility services shall not be interrupted by the Contractor to relocate, make connections, or interrupt for any purpose, without written approval of the Contracting Officer.

1.6.2 Request

Request for permission to shut down services shall be submitted in writing to the Contracting Officer not less than 10 calendar days prior to date of proposed interruption, except for electrical services. Request for electrical service outage/energize require a 14 calendar day notice. The request shall give the following information:

- a. Nature of Utility (Gas, L.P. or H.P., Water, Elec.)
- b. Size of line and location of shutoff.
- c. Buildings and services affected.
- d. Hours and date of shutoff.
- e. Estimated length of time service will be interrupted.

1.6.3 Service Interruptions

Services shall not be shut off until receipt of approval of the proposed hours and date from the Contracting Officer.

1.6.4 Timely Disconnections

Shutoffs which will cause interruption of Government work operations as determined by the Contracting Officer shall be accomplished during regular non-work hours or non-work days of the Using Agency without any additional cost to the Government.

1.6.5 Utilities Operation

Operation of valves on water mains will be by Government personnel. Where shutoff of water lines interrupts service to fire hydrants or fire sprinkler systems, the Post Fire Department shall be notified by the Contractor in writing 72 hours prior to the proposed interruption. The Contractor shall arrange his operations and have sufficient material and personnel available to complete the work without undue delay and shall restore service without delay in event of emergency.

1.6.6 Gas

Flow in gas mains which have been shut off shall not be restored until the Contractor has coordinated with the Government and has determined that all items serviced by the gas line have been shut off.

1.7 PHYSICAL DATA

The physical conditions indicated on the drawings and in the specifications are the result of surveys and borings. See Section 01055 SOIL BORING DATA

for boring logs and data.

1.8 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the Contract Clause entitled "Default: (Fixed Price Construction)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

- a. The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.
- b. The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

1.8.1 Schedule

The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS BASED ON (5) DAY WORK WEEK

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Langley AFB	9	9	9	6	7	6	7	7	5	6	7	9

1.8.2 Records

Upon acknowledgement of the Notice to Proceed and continuing throughout the contract, the contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the contractor's scheduled work day.

1.8.3 Impacted Days

The number of actual adverse weather days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day in each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in the schedule of monthly anticipated adverse weather delays, above, the contracting officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the Contract Clauses entitled "Default (Fixed Price Construction)".

1.9 SITE CONTAMINATION

1.9.1 Compliance Requirements

The Contractor shall comply with applicable Federal, state and local laws, codes, ordinances and regulations (including the obtaining of licenses and permits) in connection with any hazardous material, substance or waste.

1.9.2 Requirements

The requirements of this clause and any act or failure to act by the Government shall not relieve the Contractor of any responsibility or liability for the safety of Government, Contractor or subcontractor personnel or property.

1.9.3 Contamination

In the event that contamination beyond that shown or specified is encountered, the Contracting Officer shall be advised immediately. The contamination shall be removed as directed and replaced with satisfactory material. Payment therefor will be made in conformance with the CHANGES clause of the CONTRACT CLAUSES.

1.10 HISTORICAL AND ARCHAEOLOGICAL FINDS

Federal legislation provides for the protection, preservation, and collection of scientific, prehistorical, historical, and archaeological data, including relics and specimens which might otherwise be lost due to alteration of the terrain or building features as a result of any Federal construction project. Should the Contractor, or any of the Contractor's employees, or parties operating or associated with the Contractor, in the performance of this contract discover evidence of possible scientific, prehistorical, historical, or archaeological data, the Contractor shall immediately cease work at that location and notify the Contracting Officer, giving the location and nature of the findings. The Contractor shall forward written confirmation to the Contracting Officer as directed. The Contractor shall exercise care so as not to disturb or damage artifacts or fossils uncovered during excavation operations, and shall provide such cooperation and assistance as may be necessary to preserve the findings for removal or other disposition. Any person who, without permission, injures, destroys, excavates, appropriates, or removes any historical or prehistorical artifact, object of antiquity, or archaeological resource on the public lands of the United States is subject to arrest and penalty of law. Where appropriate by reason of discovery, the Contracting Officer may order delays in the time of performance or changes in the work, or both. If such delays or changes are ordered, an equitable adjustment will be made in the contract in accordance with the applicable clauses of the contract.

1.11 EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE

1.11.1 Allowable Costs

Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a Contractor or subcontractor at any tier shall be based on actual cost data when the Government can determine both ownership and operating costs for each piece of equipment or equipment groups of similar serial and series from the Contractor's accounting records. When both ownership and operating costs cannot be determined from the Contractor's accounting records, equipment costs shall be based upon the applicable provisions of EP 1110-1-8,

"Construction Equipment Ownership and Operating Expense Schedule," Region I. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retrospective pricing, the schedule in effect at the time the work was performed shall apply.

1.11.2 Rental Costs

Equipment rental costs are allowable, subject to the applicable provisions of the Federal Acquisition Regulations, and shall be substantiated by certified copies of paid invoices. Rates for equipment rented from an organization under common control, lease-purchase or sale-leaseback arrangements will be determined using the schedule except that rental costs leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees are allowable. Costs for major repairs and overhaul are unallowable.

1.11.3 Equipment Costs

When actual equipment costs are proposed and the total amount of the pricing action is over \$25,000, cost or pricing data shall be submitted on the Standard Form 1411, "Contract Pricing Proposal Cover Sheet". By submitting cost or pricing data, the Contractor grants to the Contracting Officer or an authorizing representative the right to examine those books, records, documents and other supporting data that will permit evaluation of the proposed equipment costs. After price agreement the Contractor shall certify that the equipment costs or pricing data submitted are accurate, complete and current.

1.12 SUBCONTRACTS AND WORK COORDINATION

Contract Clauses "SUBCONTRACTS", "PERMITS AND RESPONSIBILITIES", and "MATERIAL AND WORKMANSHIP" are supplemented as follows:

- a. Divisions or sections of specifications are not intended to control the Contractor in dividing the work among subcontractors, or to limit work performed by any trade.
- b. Contractor shall be responsible for coordination of the work of the trades, subcontractors, and materials.
- c. The Government or its representative will not undertake to settle any difference between the Contractor and Contractor's subcontractors, or between subcontractors.
- d. The Government reserves the right to refuse to permit employment on the work or require dismissal from the work of any subcontractor who, by reason of previous unsatisfactory work on Corps of Engineers projects, or for any other reason is considered by the Contracting Officer to be incompetent or otherwise objectionable.

1.13 PROFIT

1.13.1 Weighted Guidelines

Weighted guidelines method of determining profit shall be used on any equitable adjustment change order or modification issued under this contract. The profit factors shall be as follows:

Factor	Rate	Weight	Value
Degree of Risk	20		
Relative difficulty of work	15		
Size of Job	15		
Period of performance	15		
Contractor's investment	05		
Assistance by Government	05		
Subcontracting	<u>25</u>		
	100		

1.13.2 Value

Based on the circumstances of each procurement action, each of the above factors shall be weighted from .03 to .12 as indicated below. The value shall be obtained by multiplying the rate by the weight. The value column when totalled indicates the fair and reasonable profit percentage under the circumstances of the particular procurement.

1.13.2.1 Degree of Risk

Where the work involves no risk or the degree of risk is very small, the weighting should be .03; as the degree of risk increases, the weighting should be increased up to a maximum of .12. Lump sum items will have, generally, a higher weighted value than the unit price items for which quantities are provided. Other things to consider: the portion of the work to be done by subcontractors, nature of work, where work is to be performed, reasonableness of negotiated costs, amount of labor included in costs, and whether the negotiation is before or after performance of work.

1.13.2.2 Relative Difficulty of Work

If the work is most difficult and complex, the weighting should be .12 and should be proportionately reduced to .03 on the simplest of jobs. This factor is tied in to some extent with the degree of risk. Some things to consider: the nature of the work, by whom it is to be done, where, and what is the time schedule.

1.13.2.3 Size of Job

All work not in excess of \$100,000 shall be weighted at .12. Work estimated between \$100,000 and \$5,000,000 shall be proportionately weighted from .12 to .05.

1.13.2.4 Periods of Performance

Jobs in excess of 24 months are to be weighted at .12. Jobs of lesser duration are to be proportionately weighted to a minimum of .03 for jobs not to exceed 30 days. No weight where additional time not required.

1.13.2.5 Contractor's Investment

To be weighted from .03 to .12 on the basis of below average, average, and

above average. Things to consider: amount of subcontracting, mobilization payment item, Government furnished property, equipment and facilities, and expediting assistance.

1.13.2.6 Assistance by Government

To be weighted from .12 to .03 on the basis of average to above average. Things to consider: use of Government owned property, equipment and facilities, and expediting assistance.

1.13.2.7 Subcontracting

To be weighted inversely proportional to the amount of subcontracting. Where 80 percent or more of the work is to be subcontracted, the weighting is to be .03 and such weighting proportionately increased to .12 where all the work is performed by the Contractor's own forces.

1.14 BLASTING

Blasting will not be permitted.

1.15 CONTRACT DRAWINGS

Text

PART 2 PRODUCTS (THIS PART NOT USED)

PART 3 EXECUTION (THIS PART NOT USED)

-- End of Section --

SECTION 01055

SOIL BORING DATA
03/2002

PART 1 GENERAL

1.1 General

The following pages are logs of hand augered and Standard Penetration testing boring logs and plate bearing test results representing the subsurface investigations in the project vicinity at Langley Air Force Base. The information contained herein represents the basic subsurface conditions at the project site.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1586	(1999) Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils
ASTM D 2487	(2000) Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2488	(2000) Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

1.3 BORING LOCATIONS

Approximate boring locations are shown on the attached sketches. All borings designated 101 DH are located east and adjacent to the project limits.

1.4 CHARACTER OF MATERIALS AND CONDITIONS ENCOUNTERED

The soil boring and test result data are believed to show the nature of the materials encountered at those specific locations and depths; conditions vary between and below explorations. These data shall be carefully studied by the Contractor, but shall not be implied as fully descriptive and complete. The Contractor shall obtain whatever additional data they deem necessary to properly bid and construct the project in accordance with the drawings and specifications.

1.5 BORING NOTES

1.5.1 Soil Sample Borings

Soils (ML, CL, GP, etc.) are classified in accordance with ASTM D 2487. Soils are described in the field in accordance with [ASTM D 2488.] [Burmister's Method of Material Proportions, as presented below.

<u>Descriptive or Qualifying Terms</u>	<u>Range of Proportions</u>
"Sandy", "Gravelly", or the term "and"	30% to 50%
"Clayey", "Silty", "with"	15% to 50%
"little"	15% to 30%
"trace"	10% to 15%
	1% to 10%]

1.5.1.1 SPT Borings [xxxDH-1 through xxxDH-yy]

Borings [xxxDH-1 through xxxDH-yy] were performed in accordance with the Standard Penetration Test (SPT) method as described by ASTM D 1586. SPT data indicate depth of a sample and number of blows required to drive a 2 inch (50 mm) O.D. split spoon sampler 6 inch (150 mm), unless otherwise noted, into undisturbed soil with a 140 pound (0.625 kN) hammer falling 30 inches (0.75 meters). The standard penetration "N" value is the sum of the middle two 6-inch drives, i.e., 2, 4, 5, 8, N=9 when driving the split spoon sampler 24 inches; or the sum of the last two 6-inch drives, i.e., 3, 6, 7, N=13 when driving the split spoon sampler 18 inches. Soils consistencies can be estimated from the following tables, based upon the field-derived SPT data:

<u>Relative Density of Gravels/Sands</u>	
<u>No. of Blows N</u>	<u>Relative Density</u>
0-4	Very Loose
4-10	Loose
10-30	Medium
30-50	Dense
Over 50	Very Dense

<u>Consistency of Clays/Silts,</u>	
<u>No. of Blows N</u>	<u>Consistency</u>
0-2	Very Soft
2-4	Soft
4-8	Medium
8-15	Stiff
15-30	Very Stiff
Over 30	Hard

1.5.1.2 Hand Auger Borings [xxHA-1 through x]

Borings [xxHA-1 through x] were hand augered using a 2 in. (50 mm) Art bit.] [Estimated consistencies are based on an equivalent Field penetration test developed by the Norfolk District and described below:

<u>Trust Effort</u>	<u>Estimated Blows</u>	<u>Consistency</u>
1/4" (6mm) or less	11+	Dense, Stiff
1/4" (6mm) to 1/2" (13mm)	10	Medium
1/2" (13mm) to 3/4" (19mm)	9	Loose/Medium
3/4" (19mm) to 1" (25mm)	8	Loose/Medium
1" (25mm) to 1 1/2" (38mm)	7	Loose/Medium
1 1/2" (38mm) to 2" (51mm)	6	Loose/Medium
2" (51mm) to 3" (76mm)	5	Loose/Soft

3" (76mm) to 5" (127mm)	4	Soft
T4	3	Very Soft
T2	2	Very Soft]

1.5.2 Elevations and Locations

All elevation and locations are approximate.

1.5.3 Dates

Dates shown on logs are start and completion dates.

1.6 Abbreviations

WOR = Water on Rod - the water level when it is first encountered during drilling.

WOC = Water on Completion - the water level in an uncased hole, unless otherwise noted, at completion.

W @ 24 hrs. = Water at 24 hours - the water level in an uncased hole, unless otherwise noted, 24 hours after completion.

NFWOC = No Free Water on Completion.

ang - angular (angle)
 bd - bedded (bedding)
 bld - boulders
 blk - black
 blu - blue
 BOH - Bottom of Hole
 bot - bottom
 brk - broken
 brn - brown
 calc - calcareous
 cav - cavity (cavern)
 CI - cave in
 cly - clayey
 cob - cobble
 const - consistency
 CPT - Cone Penetration Test
 CPTU - CPT w/ pore pressure measurements
 crs, c - coarse
 dia - diameter
 dk - dark
 dns - dense
 e - void ratio
 Eq-Dr - Equivalent Relative Density
 ev - evident
 fn, f - fine
 frac - fracture (d)
 frag - fragments (fragmented)
 Fs - Friction Sleeve Stress
 G - specific gravity

gra - grain (ed)
grn - green
gry - gray
gvy - gravelly
hi - high (ly)
horiz - horizon
HP - high plasticity
hrd - hard
hrs - hours
incl - included, including
intbd - interbedded
jt - joint (s)
lam - laminated
len - lense
lit - little
LL - liquid limit
LOI - loss on ignition
LP - low plasticity
lse - loose
lt - light
med,m - medium
mica - micaceous
mod - moderate (ly)
moist - moisture
mot - mottled
MP - medium plasticity
mrb - marble
mst - moist
NP - nonplastic
num - numerous
occ - occasional
OD - outside diameter
odr - odor
org - organic
PCFD-pound per cubic ft, dry
PCFW-pound per cubic ft, wet
PHI - Friction Angle
PI - Plastic Index
Piez - Piezometer
PL - Plastic Limit
plast - plastic, plasticity
pln - plane
Qc - End Bearing Stress
Rf - Friction Ratio
rd - red
rnd - rounded
sam - sample
sat - saturated
sbr - subrounded
sdy - sandy
sft - soft
sh - shaley
[SIGV - not identified ?]
slt - slight (ly)
sly - silty
som - some
SSS - Split Spoon Sampler
st - stain (ed)
sta - station

SPT - Standard Penetration Test
str - stringers
Su - Undrained Shear Strength
SYM - symbol
t - thin
th - thick
tr - trace
TV - Torvane
UND - undisturbed sample
v - very
v.f. - very fine
vert - vertical
VS - vane shear
w - moisture content
w.l. - water level
w/ - with
wd - weathered
wht - white
WOH - weight of hammer
WROD - weight of rod
xbd - cross bedded (ing)
xln - crystalline
yel - yellow
%200 - Minus No. 200 Sieve
& - and
PART 2 PRODUCTS (NOT APPLICABLE)
PART 3 EXECUTION (NOT APPLICABLE)
-- End of Section --

SECTION 01111
SAFETY AND HEALTH REQUIREMENTS
07/00

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ENGINEERING MANUALS

EM 385-1-1	(1996) Safety and Health Requirements Manual
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CODE OF FEDERAL REGULATIONS

29 CFR 1910	Occupational Safety and Health Standards, General Industry.
29 CFR 1926	Occupational Safety and Health Standards, Construction Industry.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals having an no designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL DESCRIPTIONS:

SD-08 Manufacturer's Instructions

Safety and Health Plan; G

1.3 SAFETY REQUIREMENTS AND ACCIDENT PREVENTION

1.3.1 1 Standards

The Contractor shall comply with Occupational Safety and Health Act (OSHA) Standards, the Corps of Engineers Manual EM 385-1-1, "Safety and Health Requirements Manual," NFPA 101, and all applicable state, local, and facility safety and occupational health requirements.

1.4 SAFETY AND HEALTH PLAN

1.4.1 Preparation and Implementation

An Accident Prevention Plan (APP) shall be prepared covering onsite work to be performed by the Contractor and all subcontractors, and shall at a minimum address the requirements for an Accident Prevention Plan (APP), as contained in Appendix A, EM 385-1-1. The Contractor shall designate in writing a Safety and Health Manager who shall be responsible for the development, implementation and continual oversight of the APP. The APP shall establish, in detail, the protocols necessary for the anticipation, recognition, evaluation, and control of hazards associated with each task

to be performed. The APP shall address general safety and health requirements and procedures. The level of detail provided in the APP shall be tailored to the type of work, complexity of operations, and the anticipated hazards to be encountered. Details about some activities may not be available when the initial APP is prepared and submitted. Therefore, the APP shall address, in as much detail as possible, all anticipated tasks, their related hazards and the specific control measures to be instituted.

1.4.2 Acceptance and Modifications

Prior to submittal, the APP shall be signed and dated by the Contractor's designated Safety and Health Manager, Project Manager, and the Site Superintendent. The APP shall be submitted for review at least 10 days prior to the Pre-work Safety Conference. Deficiencies in the APP will be discussed at the Pre-work Safety Conference, and the APP shall be revised to correct the deficiencies and resubmitted for acceptance. Onsite work shall not begin until the plan has been accepted. A copy of the written APP shall be maintained onsite. Once accepted by the Contracting Officer, the Accident Prevention Plan, including Activity Hazard Analyses and all applicable plans, programs and procedures required by the Safety Manual (EM 385-1-1), will be enforced as if an addition to the contract. As work proceeds, the APP shall be adapted to new situations and new conditions. Changes and modifications to the accepted APP shall be made with the knowledge and concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Should any unforeseen hazard become evident during the performance of the work, such hazards shall be brought to the attention of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer, both verbally and in writing, for satisfactory resolution as soon as possible. In the interim, all necessary action shall be taken to re-establish and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Disregard for the provisions of this specification or the accepted APP shall be cause for stopping of work until the matter has been resolved and rectified to the satisfaction of the Contracting Officer.

1.4.3 Activity Hazard Analysis (AHA)

Activity Hazard Analysis (AHA) for each major phase of work shall be submitted and updated during the project. Each Activity Hazard Analysis shall be prepared and submitted in accordance the requirements and format provided for in EM 385-1-1 (Figure 1-1), and shall be accepted as an Appendix to the project APP. The AHA shall define the activities to be performed for each major phase of work, identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the AHA has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the onsite Government representatives. The Activity Hazard Analysis shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations.

1.5 Corps of Engineers Standards

Corps of Engineers Manual EM 385-1-1, referred to in "ACCIDENT PREVENTION" article of Contract Clauses, is hereby highlighted, supplemented, or revised as follows:

1.5.1 Conflicts

When a conflict exists between the Corps of Engineers Safety and Health Requirements Manual, other safety requirements, or the contract plans and/or specifications, the most stringent requirement shall prevail, as determined by the Contracting Officer.

1.5.2 Front End Loader - Backhoe Machines

1.5.2.1 Non-compliance Safety Check

All front end loader-backhoe machines and other machines, such as tractors that utilize a backhoe attachment, shall be checked for:

1. Exposed backhoe boom swing foot pedals.
2. Backhoe boom swing lever which can be reached by a man standing on the ground or on the outrigger support bracket.

1.5.2.2 Correction and Fabrication of Non-compliance Safety Items

Where these conditions exist, guards shall be fabricated to:

1. Cover over exposed foot pedals to prevent someone from accidentally stepping on them.
2. Enclose the swing lever so as to preclude operation from the ground or from the outrigger support bracket.

1.5.3 Attendance at Safety Meetings

In order to allow for maximum attendance at weekly tool box safety meetings and monthly supervisor safety meetings by Corps of Engineers personnel, the Contractor shall advise the CO's Office, a minimum of 48 hours before the start of each meeting, of the date, time and location of Safety Meetings.

1.5.4 Minutes of Safety Meetings

Minutes shall be prepared by the Contractor and forwarded to the Contracting Officer by close of business of the next working day.

1.5.5 Protective Footwear

Protective footwear as defined by American National Standards Institute Z41 shall be worn by all working personnel on site.

1.5.6 Ground Fault Circuit Interrupters (GFCI)

GFCI's are required for work on this contract in accordance with EM 385-1-1. GFCI's are also required when using electric power extension cords.

1.5.7 Crawler-, Truck-, and Wheel-Mounted Cranes

Implementation of paragraph 16.D.05 shall include the following:

- a. When a crane is performing duty cycle work (such as clamshell, dragline, grapple, or pile driving) it does not require anti-two block equipment. If the crane is required to make a non-duty cycle lift (for

example, to lift a piece of equipment, a tool box, or supplies), it will be exempt from the anti-two block equipment requirements if the following procedures are implemented:

- (1) an international orange warning device (warning flag, warning tape, or warning ball) is properly secured to the hoist line at a distance of 8 to 10 feet above the hoist rigging;
- (2) the signal person (or an individual designated as the signal person) acts as a spotter to alert the crane operator with a "STOP" signal when the warning device approaches the boom tip and the crane operator ceases hoisting functions when alerted of this; and
- (3) while the non-duty cycle lift is underway, the signal person shall not stand under the load, shall have no duties other than signal person, and shall comply with the signaling requirements of EM 385-1-1;

b. Anti-two block devices are always required when hoisting personnel by crane or derrick.

1.5.8 Fall Protection

Workers performing roof work and structural steel assembly shall utilize a fall protection system when exposed to falls of 6 feet or more.

1.5.9 Language

The on-site first line supervisors shall be capable of speaking the language of the crew and English.

1.5.9.1 Designated First-Aid and CPR trained attendants.

The Contractor shall designate at least 2 persons who are currently trained in first aid and CPR by the American Red Cross or other approved agency for each work shift, and these individuals shall be on site at all times during site operations. They shall be trained in universal precautions and in the use of PPE as described in the bloodborne Pathogens Standard of 29 CFR 1910 section .1030 and shall be included in the Contractor's Bloodborne Pathogen Program. These persons may perform other duties but shall be immediately available to render first aid when needed. A copy of each designated person's current valid first aid and CPR certificate shall be provided.

PART 2 PRODUCTS (THIS PART NOT USED)

PART 3 EXECUTION (THIS PART NOT USED)
-- End of Section --

SECTION 01200
PROJECT MEETINGS

03/98

PART 1 GENERAL

1.1 SUBMITTALS

Submittals shall be as stated in the scope of work

1.2 PRECONSTRUCTION CONFERENCE

1.2.1 Scheduling

After award of the construction contract and prior to the start of any construction work, the Contracting Officer (CO) will schedule and conduct a preconstruction conference. The Contractor's Project Manager, Superintendent and Quality Control System Manager shall attend this meeting. The Contractor is encouraged to have an officer of his company (Project Manager could be this person) and representation from each of his sub-contractors at the conference. This conference will be held at a location and time as specified by the CO.

1.2.2 Purpose

The purpose of this preconstruction conference is to enable the CO to outline the procedures that will be followed by the Government in its administration of this construction contract and to discuss the performance that will be expected from the Contractor. This conference will allow the Contractor an opportunity to ask questions about the Government's supervision and inspection of contract work, about security requirements, regulations, etc. The CO may invite Using Service personnel and any other Government personnel to attend this conference.

1.2.3 Discussion Items

The following is a list of items for discussion during the preconstruction conference. However, the Contracting Officer may include additional items for discussion as conditions and the work require.

- a. Authority of the Area/Resident Engineer and organization of the Area/Resident office.
- b. Contractor's Progress Schedule.
- c. Correspondence Procedures.
- d. Contractor Labor Standards Provisions.
- e. Contract Modifications and Administrative Procedures.
- f. Contractor's Administrative, Laydown and Storage Areas.
- g. Procedures for Processing Submittals.

- h. Payment Estimate Data and Procedures.
- i. Contractor Utilities.
- j. Security Requirements and Other Regulations, if applicable.
- k. Government Furnished Equipment, if applicable.
- l. Disposition of Salvage Property.
- m. Contractor Insurance Requirements.
- n. Value Engineering Program.
- o. Contractor Performance Evaluation.
- p. As-Built Drawings.
- q. Single Point of Contact for Warranty of Construction.
- r. Turnover of Completed Facilities.

1.3 OTHER MEETINGS

Other meetings are or may be scheduled to be held after the Preconstruction Conference, and such meetings may include the following:

- a. Accident Prevention Safety Plan
- b. Quality Control Plan.
- c. Environmental Protection Plan.
- d. Warranty Management Plan (Post Construction Warranty Conference)
- e. Red zone meeting at approximately 80% construction complete.

1.4 FACILITY MEETINGS

The Facility may also schedule meetings with the Contractor through the CO during the progress of construction work.

1.5 MINUTES OF MEETINGS

The Government will prepare minutes of the meeting and will provide the Contractor with a signed original for review and concurrence. The minutes shall include all items discussed at the meeting and the Government will make all corrections provided by the Contractor and resubmit the corrected minutes to the Contractor within seven days.

1.6 Warranty Management Plan

The Contractor shall provide a Warranty Management Plan, not less than 30 days prior to the Post-Construction Warranty Conference. As a minimum, include a table, showing the requirements, and attach certificates:

- a. List of warranties provided.

b. List of equipment, names of manufacturers and suppliers and phone numbers.

c. Period of warranties and Start Date.

d. List of Extended Warranties.

e. Warranty Certificates.

f. Single Point of Contact for Warranty of Construction.

PART 2 PRODUCTS (This Part Not Used)

PART 3 EXECUTION (This Part Not Used)

-- End of Section --

SECTION 01312

RESIDENT MANAGEMENT SYSTEM (RMS)

07/00

1 GENERAL

1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS-W) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS-Windows, referred to as RMS-QC (QC for Quality Control), to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS-W and RMS-QC will facilitate electronic exchange of information and overall management of the contract. RMS-QC provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data

1.2 CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.3 OTHER FACTORS

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, Project Schedule, Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through RMS-QC. Also, there is no separate payment for establishing and maintaining the RMS-QC database; all costs associated therewith shall be included in the contract pricing for the work.

1.4 RMS-QC SOFTWARE

RMS-QC is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the RMS-QC software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the RMS-QC software from the Government's RMS Internet Website. Upon specific justification, request by the Contractor, and approval by the Contracting Officer, the Government can provide RMS-QC on 3-1/2" high-density diskettes or CD-ROM.

Any program updates of RMS-QC will be made available to the Contractor via the Government RMS Website as they become available.

1.5 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run RMS-QC:

Hardware

IBM-compatible PC with 200 MHz Pentium or higher processor

32+ MB RAM

4 GB hard drive disk space for sole use by the RMS-QC system

3 1/2 inch high-density floppy drive

Compact disk (CD) Reader

Color monitor

Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

Connection to the Internet, minimum 28 BPS

Software

Microsoft (MS) Access 97 or newer version database software

MS Windows 95 or newer version operating system (MS Windows NT 4.0 or newer is recommended)

Word Processing software compatible with MS Word 97 or newer

Internet browser

The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

Electronic mail (E-mail) compatible with MS Outlook

1.6 RELATED INFORMATION

1.7 RMS-QC USER GUIDE

After contract award, the Contractor shall download instructions for the installation and use of RMS-QC from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.8 CONTRACTOR QUALITY CONTROL (CQC) TRAINING

The use of RMS-QC will be discussed with the Contractor's QC System Manager during the mandatory training entitled "Construction Quality Management For

Contractors". In addition, informal training sessions on use of the QC RMS program are conducted periodically and offered by the Corps of Engineers. Specific times and locations are available from the Contracting Officer.

1.9 CONTRACT DATABASE

Prior to the pre-construction conference, the Government shall provide the Contractor with basic contract award data to use for RMS-QC. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.10 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the RMS-QC database throughout the duration of the contract. The Contractor shall establish and maintain the RMS-QC database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The RMS-QC database typically shall include current data on the following items:

1.11 ADMINISTRATION

1.11.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

1.11.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in RMS-QC. Within 14 calendar days of receipt of RMS-QC software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

1.11.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.12 FINANCES

1.12.1 Pay Activity Data

The RMS-QC database shall include a list of pay activities that the

Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.1.12.2 Payment Requests

All progress payment requests shall be prepared using RMS-QC. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using RMS-QC. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.13 QUALITY CONTROL (QC)

RMS-QC provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the RMS-QC generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01451, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.13.1 Daily Contractor Quality Control (CQC) Reports.

RMS-QC includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by RMS-QC shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the RMS-QC-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.13.2 Deficiency Tracking.

The Contractor shall use RMS-QC to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC Comments. The contractor shall maintain a current log of its QC comments in the RMS-QC database. The Government will log the deficiencies it has identified using its QA comments. The Government's QA comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA comments.

1.13.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in RMS-QC.

1.13.4 Accident/Safety Tracking.

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize RMS-QC to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

1.13.5 Features of Work

The Contractor shall include a complete list of the features of work in the RMS-QC database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.13.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in RMS-QC. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via RMS-QC.

1.14 SUBMITTAL MANAGEMENT

The Government will provide the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns as described in Section 01330, SUBMITTAL PROCEDURES. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use RMS-QC to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using RMS-QC. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.15 SCHEDULE

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts", and Section 01320, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the RMS-QC database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01320 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.16 IMPORT/EXPORT OF DATA

RMS-QC includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

1.17 IMPLEMENTATION

Contractor use of RMS-QC as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its RMS-QC database, and to provide the Government with regular database updates. RMS-QC shall be an integral part of the Contractor's management of quality control.

1.18 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the RMS-QC built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

1.19 FILE MEDIUM

The Contractor shall submit required data on 3-1/2" double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.20 DISK OR CD-ROM LABELS

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the RMS-QC file name, full contract number, project name, project location, data date, name and telephone number of person responsible for the data.

1.21 FILE NAMES

The Government will provide the file names to be used by the Contractor with the RMS-QC software.

9. MONTHLY COORDINATION MEETING

The Contractor shall update the RMS-QC database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions. The contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable RMS-QC export file is received.

1.22 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

-- End of Section --

SECTION 01320

PROJECT SCHEDULE
07/2000

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referenced in the text by basic designation only.

ENGINEERING REGULATIONS (ER)

ER 1-1-11 (1995) Progress, Schedules, and Network Analysis Systems

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals having no designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Initial Project Schedule; G
Preliminary Project Schedule; G
Periodic Schedule Updates; G

Four copies of the schedules showing codes, values, categories, numbers, items, etc., as required.

SD-08 Manufacturer's Instructions

Qualifications;

Documentation showing qualifications of personnel preparing schedule reports.

SD-09 Manufacturer's Field Reports

Narrative Report;
Schedule Reports;

Four copies of the reports showing numbers, descriptions, dates, float, starts, finishes, durations, sequences, etc., as required.

1.3 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project shall also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 STANDARD DATA EXCHANGE FORMAT (SDEF)

In collaboration with scheduling software vendors, construction management consultants, professional associations, and other Federal agencies, the U.S. Army Corps of Engineers Construction Engineering Research Laboratories (CERL) has facilitated the development of a Standard Data Exchange Format (SDEF) for scheduling software. This standard uses a 132-character fixed field; an ASCII file to specify the position, length, and definition of all required project planning and control information. Since most scheduling software can already export ASCII data, software vendors can easily revise existing export routines to provide the data in the SDEF. Several software vendors already support SDEF. Project schedule electronic data shall be provided in SDEF as described later in this section. The document "Contractor's Guide to Standard Data Exchange Format" is a general guide to SDEF and is available from the Contracting Officer to the successful bidder.

3.3 RESIDENT MANAGEMENT SYSTEM (WINRMS)

Scheduling data shall be in SDEF. Scheduling software, capable of producing an SDEF file (standard data exchange format), shall electronically transfer activity data into the Resident Management System (RMS) Contractor Quality Control Module (RMS QC), see Section 01312, RESIDENT MANAGEMENT SYSTEM (RMS).

3.4 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel will result in an inability of the Contracting Officer to evaluate Contractor's progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.5 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual

methods used to produce any required information shall require approval by the Contracting Officer.

3.5.1 Use of the Bar-Chart Method

The Bar Chart Method (BCM) shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in the Precedence Diagram Method (PDM).

3.5.2 Level of Detail Required

The Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule:

3.5.2.1 Activity Durations

Contractor submissions shall follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods (usually less than 2 percent of all non-procurement activities' Original Durations are greater than 20 days).

3.5.2.2 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, and delivery.

3.5.2.3 Government Activities

Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to: approvals, inspections, utility tie-in, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements.

3.5.2.4 Workers Per Day

All activities shall have an estimate of the average number of workers per day that are expected to be used during the execution of the activity. If no workers are required for an activity, in case of activities related to procurement, for example, the activity shall be identified as using zero workers per day. The workers per day information for each activity shall be identified by the Workers Per Day Code.

3.5.2.5 Responsibility

All activities shall be identified in the project schedule by the party responsible to perform the work. Responsibility includes, but is not limited to, the subcontracting firm, contractor work force, or government agency performing a given task. Activities shall not belong to more than one responsible party. The responsible party for each activity shall be

identified by the Responsibility Code. The responsibility codes used must be coordinated with those used in RMS.

3.5.2.6 Work Areas

For projects with separate work areas, all activities shall be identified in the project schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code.

3.5.2.7 Modification or Claim Number

Any activity that is added or changed by contract modification or used to justify claimed time shall be identified by a mod or claim code that changed the activity. Activities shall not belong to more than one modification or claim item. The modification or claim number of each activity shall be identified by the Mod or Claim Number. Whenever possible, changes shall be added to the schedule by adding new activities. Existing activities shall not normally be changed to reflect modifications.

3.5.2.8 Bid Item

All activities shall be identified in the project schedule by the Bid Item to which the activity belongs. An activity shall not contain work in more than one bid item. The bid item for each appropriate activity shall be identified by the Bid Item Code. The Bid Item Numbers used in the schedule must exactly match those in the RMS data disk provided by the Contracting Officer.

3.5.2.9 Phase of Work

For projects with separate phases of construction, all activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

3.5.2.10 Category of Work

All Activities shall be identified in the project schedule according to the category of work which best describes the activity. The category of work for each activity shall be identified by the Category of Work Code. The category of work codes must be coordinated with those used by RMS.

3.5.2.11 Feature of Work

All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to, a work breakdown structure for the project. The feature of work for each activity shall be identified by the Feature of Work Code. Whenever possible, the feature of work title shall match those in RMS. Other features may be added if those in RMS do not adequately describe the work.

3.5.3 Scheduled Project Completion

The schedule interval shall extend from NTP to the contract completion date.

3.5.3.1 Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.5.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the bar-chart. The Contractor shall include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have an "LF" constraint date equal to the completion date for the project, and a zero day duration.

3.5.3.3 Early Project Completion

In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted in the narrative report at every project schedule update period to assist the Contracting Officer in evaluating the Contractor's ability to actually complete prior to the contract period.

3.5.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.5.4.1 Start Phase

The Contractor shall include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

3.5.4.2 End Phase

The Contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the completion date for the project, and a zero day duration.

3.5.4.3 Phase X

The Contractor shall include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" activity shall be logically tied to the earliest and latest activities in the phase.

3.5.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default

mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports those dates logged in RMS QC. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report in RMS QC for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports in RMS QC is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Program features which calculate one of these parameters from the other shall be disabled.

3.5.6 Out-of-Sequence Progress

Activities that have posted progress without all preceding logic being satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case approval of the Contracting Officer. The Contractor shall propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule.

3.5.7 Extended Non-Work Periods

Designation to Holidays to account for non-work periods of over 7 days shall not be allowed. Non-work periods of over 7 days shall be identified by addition of activities that represent the delays. Modifications to the logic of the project schedule shall be made to link those activities that may have been impacted by the delays to the newly added delay activities.

3.5.8 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

3.6 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.6.1 Preliminary Project Schedule Submission

The Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days shall be submitted for approval within 15 calendar days after the NTP is acknowledged. The approved preliminary schedule shall be used for payment purposes not to exceed 90 calendar days after NTP. The Preliminary Project Schedule shall be prepared in the contractor's NAS scheduling software system and include subcontractor codes, features of work, and pay activities for the contractor's planned operations during the first 90 calendar days.

3.6.2 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for approval within 45 calendar days after NTP. The schedule shall provide a reasonable sequence of activities which represent work through the entire project and shall be at a reasonable level of detail.

3.6.3 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

3.6.4 Standard Activity Coding Dictionary

The Contractor shall use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used. All codes must be carefully coordinated with those used in RMS.

3.7 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the preliminary submission, initial submission, and every periodic project schedule update throughout the life of the project:

3.7.1 Data Disks

One data disk containing the project schedule shall be provided. Data on the disks shall adhere to the SDEF format specified in ER 1-1-11, Appendix A. Data disks required from RMS QC shall be provided in addition to this disk.

3.7.1.1 File Medium

Required data shall be submitted on 3.5 disks, formatted to hold 1.44 MB of data, under the MS-DOS Version 5. or 6.x, unless otherwise approved by the Contracting Officer.

3.7.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Preliminary, Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the MS-DOS version used to format the disk.

3.7.1.3 File Name

Each file submitted shall have a name related to either the schedule data date, project name, or contract number. The Contractor shall develop a naming convention that will ensure that the names of the files submitted are unique. The Contractor shall submit the file naming convention to the Contracting Officer for approval.

3.7.2 Narrative Report

A Narrative Report shall be provided with the preliminary, initial, and each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the 2 most critical

paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to relay to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through that analysis.

3.7.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.7.4 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in progress or completed.

3.7.4.1 Activity Report

A list of all activities sorted according to activity number.

3.7.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number. Preceding and succeeding activities shall include all information listed above in paragraph Schedule Reports. A blank line shall be left between each activity grouping.

3.7.4.3 Total Float Report

A list of all incomplete activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates. Completed activities shall not be shown on this report.

3.7.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the NTP until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; and complete and sum all bid items to provide a total project percent complete. The printed report shall contain, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), and Earnings to Date. Reports from RMS QC, containing the information described above, may be provided in lieu of this report.

3.7.5 Network Diagram

The network diagram shall be required on the initial schedule submission and on monthly schedule update submissions. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.7.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity number, description, duration, and estimated earned value shall be shown on the diagram.

3.7.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.7.5.3 Bar-Chart

The Bar-Chart shall be clearly shown.

3.7.5.4 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.7.5.5 S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

3.8 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss the project schedule shall include a monthly onsite meeting or other regular more frequent intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will approve activity progress, proposed revisions, and adjustments as appropriate.

3.8.1 Meeting Attendance

The Contractor's Project Manager and Scheduler shall attend the regular progress meeting.

3.8.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

3.8.3 Progress Meeting Contents

Update information, included below, shall be subject to the approval of the

Contracting Officer. As a minimum, the Contractor shall address the following items on an activity by activity basis during each progress meeting.

3.8.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed .

3.8.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations shall be based on Remaining Duration for each activity.

3.8.3.3 Cost Completion

The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

3.8.3.4 Logic Changes

All logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, lag durations, and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

3.8.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule which does not represent the actual or planned prosecution and progress of the work.

3.9 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, or any interim milestone date, the Contractor shall furnish the following for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

3.9.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request.

The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions,

which result in the extension of the schedule, will not be a cause for a time extension to the contract completion date.

3.9.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

- a. A list of affected activities, with their associated project schedule activity number.
- b. A brief explanation of the causes of the change.
- c. An analysis of the overall impact of the changes proposed.
- d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

3.9.3 Additional Submission Requirements

For any requested time extension of over 2 weeks, the Contracting Officer may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

3.10 DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, the Contractor shall advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.11 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

-- End of Section --

SECTION 01330

SUBMITTAL PROCEDURES

03/01

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Government-Furnished Information

Submittal register database and submittal management program will be delivered to the contractor, by the Contracting Officer utilizing the RMS. Register will have the following fields completed, to the extent that will be required by the Government during subsequent usage.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-04 Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Column (f): Indicate approving authority for each submittal. A "G" indicates approval by contracting officer; a blank indicates approval by QC manager.

1.2 DEFINITIONS

1.2.1 Submittal

Shop drawings, product data, samples, and administrative submittals presented for review and approval. Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

1.2.2 Types of Submittals

All submittals are classified as indicated in paragraph "Submittal Descriptions (SD)". Submittals also are grouped as follows:

- a. Shop drawings: As used in this section, drawings, schedules, diagrams, and other data prepared specifically for this contract, by contractor or through contractor by way of subcontractor, manufacturer, supplier, distributor, or other lower tier contractor, to illustrate portion of work.
- b. Product data: Preprinted material such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate portion of work, but not prepared exclusively

for this contract.

- c. Samples: Physical examples of products, materials, equipment, assemblies, or workmanship that are physically identical to portion of work, illustrating portion of work or establishing standards for evaluating appearance of finished work or both.
- d. Administrative submittals: Data presented for reviews and approval to ensure that administrative requirements of project are adequately met but not to ensure directly that work is in accordance with design concept and in compliance with contract documents.

1.3 SUBMITTAL IDENTIFICATION (SD)

Submittals required are identified by SD numbers and titles as follows:

SD-01 Preconstruction Submittals

Certificates of insurance.
Surety bonds.
List of proposed subcontractors.
List of proposed products.
Construction Progress Schedule.
Submittal schedule.
Schedule of values.
Health and safety plan.
Work plan.
Quality control plan.
Environmental protection plan.

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the contractor for integrating the product or system into the project.

Drawings prepared by or for the contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily checklists

Final acceptance test and operational test procedure

SD-07 Certificates

Statements signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

Factory test reports.

1.3.1 Approving Authority

Person authorized to approve submittal.

1.3.2 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce construction and materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.4 SUBMITTALS

Submit the following in accordance with the requirements of this section.

SD-01 Preconstruction Submittals

Submittal register; G

1.5 USE OF SUBMITTAL REGISTER DATABASE

Prepare and maintain submittal register, as the work progresses. Use electronic submittal register program furnished by the Government. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by government; retain data which is output in columns (a), (g), (h), and (i) as approved.

1.5.1 Submittal Register

Submit submittal register as an electronic database, using RMS program furnished to contractor. Submit with quality control plan and project schedule required by Section 01451A, "Quality Control." Do not change data in columns (c), (d), (e), and (f) as delivered by the government. Verify that all submittals required for project are listed and add missing submittals. Complete the following on the register database:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column (h) Contractor Approval Date: Date contractor needs approval of submittal.

Column (i) Contractor Material: Date that contractor needs material delivered to contractor control.

1.5.2 Contractor Use of Submittal Register

Update the following fields in the government-furnished submittal register program fields in program utilized by contractor.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (j) Action Code (k): Date of action used to record contractor's review when forwarding submittals to QC.

Column (l) List date of submittal transmission.

Column (q) List date approval received.

1.5.3 Approving Authority Use of Submittal Register

Update the following fields in the government-furnished submittal register program fields in program utilized by contractor.

Column (b).

Column (l) List date of submittal receipt.

Column (m) through (p).

Column (q) List date returned to contractor.

1.5.4 Contractor Action Code and Action Code

Entries used will be as follows (others may be prescribed by Transmittal Form):

NR - Not Received

AN - Approved as noted

A - Approved

RR - Disapproved, Revise, and Resubmit

1.5.5 Copies Delivered to the Government

Deliver one copy of submitted register updated by contractor to government with each invoice request. Deliver in electronic format, unless a paper copy is requested by contracting officer.

1.6 PROCEDURES FOR SUBMITTALS

1.6.1 Reviewing, Certifying, Approving Authority

QC organization shall be responsible for reviewing and certifying that submittals are in compliance with contract requirements. Approving authority on submittals is QC manager unless otherwise specified for specific submittal. At each "Submittal" paragraph in individual specification sections, a notation "G," following a submittal item, indicates contracting officer is approving authority for that submittal item.

1.6.2 Constraints

- a. Submittals listed or specified in this contract shall conform to provisions of this section, unless explicitly stated otherwise.
- b. Submittals shall be complete for each definable feature of work; components of definable feature interrelated as a system shall be submitted at same time.
- c. When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.

- d. Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

1.6.3 Scheduling

- a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential requirements to resubmit. All submittals requiring government approval shall be submitted within 63 days (calendar) of issuance of Notice to Proceed.
- b. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least 15 working days for submittals for QC manager approval and 20 working days for submittals for contracting officer approval. Period of review for submittals with contracting officer approval begins when Government receives submittal from QC organization. Period of review for each resubmittal is the same as for initial submittal. The Government will take 14 days for review and return of each submittal.

1.6.4 Variations

Variations from contract requirements require Government approval pursuant to contract Clause entitled "FAR 52.236-21, Specifications and Drawings for Construction" and will be considered where advantageous to government.

1.6.4.1 Considering Variations

Discussion with contracting officer prior to submission, will help ensure functional and quality requirements are met and minimize rejections and resubmittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

1.6.4.2 Proposing Variations

When proposing variation, deliver written request to the contracting officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to government. If lower cost is a benefit, also include an estimate of the cost saving. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

1.6.4.3 Warranting That Variations Are Compatible

When delivering a variation for approval, contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.6.4.4 Review Schedule Is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Government of submittals with variations.

1.6.5 Contractor's Responsibilities

- a. Determine and verify field measurements, materials, field construction criteria; review each submittal; and check and coordinate each submittal with requirements of the work and contract documents.
- b. Transmit submittals to QC organization in accordance with schedule on approved Submittal Register, and to prevent delays in the work, delays to government, or delays to separate contractors.
- c. Advise contracting officer of variation, as required by paragraph entitled "Variations."
- d. Correct and resubmit submittal as directed by approving authority. When resubmitting disapproved transmittals or transmittals noted for resubmittal, the contractor shall provide copy of that previously submitted transmittal including all reviewer comments for use by approving authority. Direct specific attention in writing or on resubmitted submittal, to revisions not requested by approving authority on previous submissions.
- e. Furnish additional copies of submittal when requested by contracting officer, to a limit of 20 copies per submittal.
- f. Complete work which must be accomplished as basis of a submittal in time to allow submittal to occur as scheduled.
- g. Ensure no work has begun until submittals for that work have been returned as "approved," or "approved as noted", except to the extent that a portion of work must be accomplished as basis of submittal.

1.6.6 QC Organization Responsibilities

- a. Note date on which submittal was received from contractor on each submittal.
- b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.
- c. Review submittals for conformance with project design concepts and compliance with contract documents.
- d. Act on submittals, determining appropriate action based on QC organization's review of submittal.
 - (1) When QC manager is approving authority, take appropriate action on submittal from the possible actions defined in paragraph entitled, "Actions Possible."
 - (2) When contracting officer is approving authority or when variation has been proposed, forward submittal to Government with certifying statement or return submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of submittal determines appropriate action.
- e. Ensure that material is clearly legible.

- f. Stamp each sheet of each submittal with QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

(1) When approving authority is contracting officer, QC organization will certify submittals forwarded to contracting officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number _____, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Certified by QC manager _____, Date _____"
(Signature)

(2) When approving authority is QC manager, QC manager will use the following approval statement when returning submittals to contractor as "Approved" or "Approved as Noted."

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with contract Number _____, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is _____ approved for use.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Approved by QC manager _____, Date _____"
(Signature)

- g. Sign certifying statement or approval statement. The person signing certifying statements shall be QC organization member designated in the approved QC plan. The signatures shall be in original ink. Stamped signatures are not acceptable.
- h. Update submittal register [database]as submittal actions occur and maintain the submittal register at project site until final acceptance of all work by contracting officer.
- i. Retain a copy of approved submittals at project site, including contractor's copy of approved samples.

1.6.7 Government's Responsibilities

When approving authority is contracting Officer, the Government will:

- a. Note date on which submittal was received from QC manager, on each submittal for which the contracting officer is approving authority.
- b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

- c. Identify returned submittals with one of the actions defined in paragraph entitled "Actions Possible" and with markings appropriate for action indicated.

1.6.8 Actions Possible

Submittals will be returned with one of the following notations:

- a. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by contractor or for being incomplete, with appropriate action, coordination, or change.
- b. Submittals marked "approved" "approved as submitted" authorize contractor to proceed with work covered.
- c. Submittals marked "approved as noted" or "approval except as noted; resubmission not required" authorize contractor to proceed with work as noted provided contractor takes no exception to the notations.
- d. Submittals marked "revise and resubmit" or "disapproved" indicate submittal is incomplete or does not comply with design concept or requirements of the contract documents and shall be resubmitted with appropriate changes. No work shall proceed for this item until resubmittal is approved.

1.7 FORMAT OF SUBMITTALS

1.7.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels, to office of approving authority. Transmit submittals with transmittal form prescribed by contracting officer and standard for project. The transmittal form shall identify contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled "Identifying Submittals." Process transmittal forms to record actions regarding sample panels and sample installations.

1.7.2 Identifying Submittals

Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

- a. Project title and location.
- b. Construction contract number.
- c. Section number of the specification section by which submittal is required.
- d. Submittal description (SD) number of each component of submittal.

- e. When a resubmission, add alphabetic suffix on submittal description, for example, SD-10A, to indicate resubmission.
- f. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier contractor associated with submittal.
- g. Product identification and location in project.

1.7.3 Format for Product Data

- a. Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.
- b. Indicate, by prominent notation, each product which is being submitted; indicate specification section number and paragraph number to which it pertains.
- c. Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project.

1.7.4 Format for Shop Drawings

- a. Shop drawings shall not be less than 8 1/2 by 11 inches nor more than 30 by 42 inches.
- b. Present 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.
- c. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled "Identifying Submittals."
- d. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Shop drawing dimensions shall be the same unit of measure as indicated on the contract drawings. Identify materials and products for work shown.
- e. The reproduction and submission of contract drawings as shop drawings is not acceptable.

1.7.5 Format of Samples

- a. Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:
 - (1) Sample of Equipment or Device: Full size.
 - (2) Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.
 - (3) Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and

material variations.

(4) Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

(5) Sample of Non-Solid Materials: Pint. Examples of non-solid materials are sand and paint.

(6) Color Selection Samples: 2 by 4 inches.

(7) Sample Panel: 4 by 4 feet.

(8) Sample Installation: 100 square feet.

- b. Samples Showing Range of Variation: Where variations are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range.
- c. Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples shall be in undamaged condition at time of use.
- d. Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean up of project.
- e. When color, texture or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.7.6 Format of Administrative Submittals

- a. When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply contractor's approval stamp to document, but to a separate sheet accompanying document.
- B. Provide all dimensions in administrative submittals in metric. Where data are included in preprinted material with inch-pound units only, submit metric dimensions on separate sheet.

1.8 QUANTITY OF SUBMITTALS

1.8.1 Number of Copies of Product Data

- a. Submit 2 copies of submittals of product data requiring review and approval only (FIO) by QC organization and 6 copies of product data requiring review and approval (G) by the Contracting Officer.

1.8.2 Number of Copies of Shop Drawings

Submit shop drawings in compliance with quantity requirements specified for product data.

1.8.3 Number of Samples

- a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of

samples will be retained by approving authority and one will be returned to Contractor.

- b. Submit one sample panel. Include components listed in technical section or as directed.
- c. Submit one sample installation, where directed.
- d. Submit one sample of non-solid materials.

1.8.4 Number of Copies of Administrative Submittals

- a. Unless otherwise specified, submit administrative submittals compliance with quantity requirements specified for product data.
- b. Submit administrative submittals required under "SD-10 Operation and Maintenance Data" to conform to Section 01781N, "Operation and Maintenance Data."

1.9 FORWARDING SUBMITTALS

1.9.1 Samples Required of the Contractor

Submit samples to the Contracting Officer at the LAFB F-22 Project Office.

1.9.2 Shop Drawings, Product Data, and O&M Data

Within 63 days of NTP, and before procurement of fabrication, submit, the shop drawings, product data and O&M Data required in the technical sections of this specification to the Contracting Officer.

1.10 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.10.1 Government Approved (G)

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.10.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.11 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory

construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.12 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer. Contract drawings that are reproduced and submitted as "shop drawings" will be disapproved.

1.13 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

1.14 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations. The Contractor shall not reproduce contract drawings as shop drawings.

1.15 SUBMITTAL REGISTER

At the end of this section is a submittal register when project is printed showing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contractor shall maintain a submittal register for the project in accordance with Section 01312 RESIDENT MANAGEMENT SYSTEM (RMS).

1.16 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings

shall be so scheduled. Adequate time (a minimum of 14 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

1.17 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms are included in the RMS QC software that the Contractor is required to use for this contract. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

1.18 SUBMITTAL PROCEDURES

Submittals shall be made as follows:

1.18.1 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

1.19 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

1.20 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Two copies of the submittal will be retained by the Contracting Officer and Four copies of the submittal will be returned to the Contractor.

1.21 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

1.22 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR	
(Firm Name)	
_____	Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s).	
SIGNATURE: _____	
TITLE: _____	
DATE: _____	

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01355A

ENVIRONMENTAL PROTECTION
02/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. AIR FORCE (USAF)

AFI 32-1053 Pest Management Program

U.S. ARMY (DA)

AR 200-5 Pest Management

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

33 CFR 328	Definitions
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 152 - 186	Pesticide Programs
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
49 CFR 171 - 178	Hazardous Materials Regulations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

WETLAND MANUAL Corps of Engineers Wetlands Delineation
Manual Technical Report Y-87-1

1.2 DEFINITIONS

1.2.1 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants. Storm water pollution prevention measures shall be in accordance of VDOT Erosion and sediment control manual.

1.2.3 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

1.2.4 Installation Pest Management Coordinator

Installation Pest Management Coordinator (IPMC) is the individual officially designated by the Installation Commander to oversee the Installation Pest Management Program and the Installation Pest Management Plan.

1.2.4 Project Pesticide Coordinator

The Project Pesticide Coordinator (PPC) is an individual that resides at a Civil Works Project office and that is responsible for oversight of pesticide application on Project grounds.

1.2.5 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor shall discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" shall occur. Land Application shall be in compliance with all applicable Federal, State, and local laws and regulations.

1.2.6 Pesticide

Pesticide is defined as any substance or mixture of substances intended for

preventing, destroying, repelling, or mitigating any pest, or intended for use as a plant regulator, defoliant or desiccant.

1.2.7 Pests

The term "pests" means arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds and other organisms (except for human or animal disease-causing organisms) that adversely affect readiness, military operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

1.2.8 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and would require a permit to discharge water from the governing agency.

1.2.9 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

1.2.10 Wetlands

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with WETLAND MANUAL.

1.3 GENERAL REQUIREMENTS

The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

1.4 SUBCONTRACTORS

The Contractor shall ensure compliance with this section by subcontractors.

1.5 PAYMENT

No separate payment will be made for work covered under this section. The Contractor shall be responsible for payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor. All costs associated with this section shall be included in the contract price. The Contractor shall be responsible for payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local laws and regulations.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G

The environmental protection plan.

1.7 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, the Contractor shall submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern shall be defined within the Environmental Protection Plan as outlined in this section. The Contractor shall address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but which the Contractor considers necessary, shall be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, the Contractor shall meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan shall be current and maintained onsite by the Contractor.

1.7.1 Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

1.7.2 Contents

The environmental protection plan shall include, but shall not be limited to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.
- b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.
- c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.

d. Description of the Contractor's environmental protection personnel training program.

e. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. The plan shall include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.

f. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.

g. Drawing showing the location of borrow areas.

h. The Spill Control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:

1. The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer and Facility Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.

2. The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.

3. Training requirements for Contractor's personnel and methods of accomplishing the training.

4. A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.

5. The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.

6. The methods and procedures to be used for expeditious contaminant cleanup.

i. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris. The plan shall include schedules for disposal. The Contractor shall identify any subcontractors responsible for the transportation and disposal of

solid waste. Licenses or permits shall be submitted for solid waste disposal sites that are not a commercial operating facility. Evidence of the disposal facility's acceptance of the solid waste shall be attached to this plan during the construction. The Contractor shall attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. The report shall be submitted on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and shall be for the previous quarter (e.g. the first working day of January, April, July, and October). The report shall indicate the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.

j. A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources. The plan shall detail the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.

k. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.

l. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time shall be included in the contaminant prevention plan. As new hazardous materials are brought on site or removed from the site, the plan shall be updated.

m. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, and water used in flushing of storm drain lines. If a settling/retention pond is required, the plan shall include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, the plan shall include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, a copy of the permit and associated documents shall be included as an attachment prior to discharging the waste water.

n. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands that may be encountered during construction on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. The plan shall include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Contracting Officer.

1.7.3 Appendix

Copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents shall be attached, as an appendix, to the Environmental Protection Plan.

1.8 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. This survey report shall be signed by both the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor shall protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

1.9 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.10 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 ENVIRONMENTAL PERMITS AND COMMITMENTS

The Contractor shall be responsible for obtaining and complying with all

environmental permits and commitments required by Federal, State, Regional, and local environmental laws and regulations.

3.2 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, soil, or other materials displaced into uncleared areas shall be removed by the Contractor.

3.2.1 Work Area Limits

Prior to commencing construction activities, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area which are not to be disturbed shall be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

3.2.2 Landscape

Grasses and land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. The Contractor shall restore landscape features damaged or destroyed during construction operations both within and outside the limits of the approved work area.

3.2.3 Erosion and Sediment Controls

The Contractor shall be responsible for providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. The area of bare soil exposed at any one time by construction operations should be kept to a minimum. The Contractor shall construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, cover, silt fences, straw bales, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. The Contractor's best management practices shall also be in accordance with the National Pollutant Discharge Elimination System (NPDES) Storm Water Pollution Prevention Plan (SWPPP) which may be reviewed at the LAFB Environmental Office. Any temporary measures shall be removed after the area has been stabilized.

3.2.4 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Erosion and sediment controls shall be provided for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas. Contractor staging area to be improved for use by the Contractor at the contractor cost. Upon completion of construction the area shall be restored and regraded to its pre-construction condition and grade.

3.3 WATER RESOURCES

The Contractor shall monitor construction activities to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation unless otherwise indicated. All water areas affected by construction activities shall be monitored by the Contractor. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued Clean Water Act permits.

3.3.1 Cofferdams, Diversions, and Dewatering Operations

Construction operations for dewatering shall be controlled at all times to maintain compliance with existing State water quality standards and designated uses of the surface water body. The Contractor shall comply with the State of Virginia water quality standards, and the Clean Water Act Section 404.

3.4 AIR RESOURCES

Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and State air emission and performance laws and standards.

3.4.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs. The Contractor shall comply with all State and local visibility regulations.

3.4.2 Odors

Odors from construction activities shall be controlled at all times. The odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

3.5 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.5.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill shall be the minimum acceptable off-site solid waste disposal option. The Contractor shall verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. The Contractor shall comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

3.5.2 Chemicals and Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to the ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. This documentation will be periodically reviewed by the Government. Chemical waste shall be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes shall be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations.

3.5.3 Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable State and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. The Contractor shall, at a minimum, manage and store hazardous waste in compliance with 40 CFR 262 and shall manage and store hazardous waste in accordance with the Installation. The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. The Contractor shall segregate hazardous waste from other materials and wastes, shall protect it from the weather by placing it in a safe covered location, and shall take precautionary measures such as berming or other appropriate measures against accidental spillage. The Contractor shall be responsible for storage, describing, packaging, labeling, marking, and placarding of hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, State, and local laws and regulations. The Contractor shall transport Contractor generated hazardous waste off Government property within 60 days in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. The Contractor shall dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Contracting Officer and the Facility Environmental Office. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility. The

disposition of Contractor generated hazardous waste and excess hazardous materials are the Contractor's responsibility. The Contractor shall coordinate the disposition of hazardous waste with the Facility's Project Office's Hazardous Waste Manager and the Contracting Officer.

3.5.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants and oil shall be managed and stored in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations. Storage of fuel on the project site shall be accordance with all Federal, State, and local laws and regulations.

3.5.5 Waste Water

Disposal of waste water shall be as specified below.

- a. Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the construction related waste water by collecting and placing it in a retention pond where suspended material can be settled out and/or the water can evaporate to separate pollutants from the water. The site for the retention pond shall be coordinated and approved with the Contracting Officer. The residue left in the pond prior to completion of the project shall be removed, tested, and disposed off-Government property in accordance with Federal, State, and local laws and regulations. The area shall be backfilled with select material to the original grade, top-soiled and seeded/sodded. The water in the retention pond shall be tested for turbidity, PH and the results reviewed and approved by the Contracting Officer, prior to being discharged or disposed off-Government property.
- b. For discharge of ground water, the Contractor shall surface discharge in accordance with all Federal, State, and local laws and regulations.
- c. Water generated from the flushing of stormwater conveyance lines shall be land applied in accordance with all Federal, State, and local laws and regulations for land application.

3.6 RECYCLING AND WASTE MINIMIZATION FOR CONCRETE AND BITUMINOUS PAVEMENT

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project. The Contractor shall participate in recycling and waste minimization activities to divert non-hazardous solid waste.

3.7 NON-HAZARDOUS SOLID WASTE DIVERSION REPORT

The Contractor shall maintain an inventory of non-hazardous solid waste

diversion and disposal of construction and demolition debris. The Contractor shall submit a report to Langley Air Force Base CEVP through the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that non-hazardous solid waste has been generated. The following shall be included in the report:

- a. Construction and Demolition (C&D) Debris Disposed in tons.
- b. Construction and Demolition (C&D) Debris Recycled in tons.
- c. Total C&D Debris Generated tons.

3.8 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.9 BIOLOGICAL RESOURCES

The Contractor shall minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

3.10 PREVIOUSLY USED EQUIPMENT

The Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

3.11 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

3.12 MILITARY MUNITIONS

In the event the Contractor discovers or uncovers military munitions as defined in 40 CFR 260, the Contractor shall immediately stop work in that area and immediately inform the Contracting Officer.

3.13 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Additional meetings shall be conducted for new personnel and when site conditions change. The training and meeting agenda shall include: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.14 CONTAMINATED MEDIA MANAGEMENT

Contaminated environmental media consisting of, but not limited to, ground water and soils and shall be managed in accordance with Section 02072 Excavation of Petroleum Contaminated Soil.

3.15 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". The Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area shall be graded, filled and the entire area seeded unless otherwise indicated.

-- End of Section --

SECTION 01356A

STORM WATER POLLUTION PREVENTION MEASURES
08/96

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4439	(1997) Standard Terminology for Geosynthetics
ASTM D 4491	(1996) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1996)) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1995) Determining Apparent Opening Size of a Geotextile
ASTM D 4873	(1995) Identification, Storage, and Handling of Geosynthetic Rolls

1.2 GENERAL

The Contractor shall implement the storm water pollution prevention measures specified in this section in a manner which will meet the requirements of Section 01355A ENVIRONMENTAL PROTECTION, and the requirements of the National Pollution Discharge Elimination System (NPDES) permit attached to that Section.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Mill Certificate or Affidavit; G

Certificate attesting that the Contractor has met all specified requirements.

1.4 EROSION AND SEDIMENT CONTROLS

The controls and measures required by the Contractor are described below.

1.4.1 Stabilization Practices

The stabilization practices to be implemented shall include temporary seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control matts, protection of trees, preservation of mature vegetation, etc. On his daily CQC Report, the Contractor shall record the dates when the major grading activities occur, (e.g., clearing and grubbing, excavation, and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, stabilization practices shall be initiated as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.

1.4.1.1 Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.

1.4.1.2 No Activity for Less Than 21 Days

Where construction activity will resume on a portion of the site within 21 days from when activities ceased (e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the fourteenth day after construction activity temporarily ceased.

1.4.2 Structural Practices

Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff.

1.4.2.1 Silt Fences

The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. excavation of subgrade, and grading). Silt fences shall be installed in the locations indicated on the drawings. Final removal of silt fence barriers shall be upon approval by the Contracting Officer.

PART 2 PRODUCTS

2.1 COMPONENTS FOR SILT FENCES

2.1.1 Filter Fabric

The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network

such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistance to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile	ASTM D 4632	100 lbs. min.
Elongation (%)		30 % max.
Trapezoid Tear	ASTM D 4533	55 lbs. min.
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

2.1.2 Silt Fence Stakes and Posts

The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5 feet.

2.1.3 Mill Certificate or Affidavit

A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.1.4 Identification Storage and Handling

Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

PART 3 EXECUTION

3.1 INSTALLATION OF SILT FENCES

Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6 inch overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence.

The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Contracting Officer.

3.2 MAINTENANCE

The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.

3.2.1 Silt Fence Maintenance

Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall receive erosion control.

3.3 INSPECTIONS

3.3.1 General

The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month.

3.3.2 Inspections Details

Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.

3.3.3 Inspection Reports

For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report

shall be furnished to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

-- End of Section --

SECTION 01420

SOURCES FOR REFERENCE PUBLICATIONS

09/99

PART 1 GENERAL

1.1 REFERENCES

Reference publications are cited in other sections of the specifications along with identification of their sponsoring organizations. The addresses of the sponsoring organizations are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided.

AMERICAN CONCRETE INSTITUTE (ACI)

P.O. Box 9094
Farmington Hills, MI 48333-9094
Ph: 248-848-3700
Fax: 248-848-3701
Internet: <http://www.aci-int.inter.net>

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

444 N. Capital St., NW, Suite 249
Washington, DC 20001
Ph: 800-231-3475 or 202-624-5800
Fax: 800-525-5562 or 202-624-5806
Internet: www.aashto.org

AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)

222 West Las Colinas Blvd., Suite 641
Irving, TX 75039-5423
Ph: 972-506-7616
Fax: 972-506-7682
Internet: <http://www.concrete-pipe.org>
e-mail: info@concrete-pipe.org

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

1330 Kemper Meadow Dr.
Suite 600
Cincinnati, OH 45240
Ph: 513-742-2020
Fax: 513-742-3355
Internet: www.acgih.org
E-mail: pubs@acgih.org

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

One East Wacker Dr., Suite 3100
Chicago, IL 60601-2001
Ph: 312-670-2400
Publications: 800-644-2400
Fax: 312-670-2400
Internet: <http://www.aiscweb.com>

AMERICAN IRON AND STEEL INSTITUTE (AISI)

ATTN: Publication Orders
P.O. Box 4321
Chestertown, MD 21690
Ph: 800-277-3850
Fax: 410-810-0910

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

11 West 42nd St
New York, NY 10036
Ph: 212-642-4900
Fax: 212-302-1286
Internet: <http://www.ansi.org/>

AMERICAN PETROLEUM INSTITUTE (API)

1220 L St., NW
Washington, DC 20005-4070
Ph: 202-682-8000
Fax: 202-962-4776
Internet: <http://www.api.org>

AMERICAN RAILWAY ENGINEERING ASSOCIATION (AREA)

8201 Corporate Dr., Suite 1125
Landover, MD 20785
Ph: 301-459-3200
Fax: 301-459-8077

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
Ph: 610-832-9500
Fax: 610-832-9555
Internet: www.astm.org

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

1801 Alexander Bell Drive
Reston, VA 20190-4400
Ph: 703-295-6300
Fax: 703-295-6222
Internet: www.pubs.asce.org
e-mail: marketing@asce.org

AMERICAN WELDING SOCIETY (AWS)

550 N.W. LeJeune Road
Miami, FL 33126
Ph: 800-443-9353
Fax: 305-443-7559
Internet: www.amweld.org

ASPHALT INSTITUTE (AI)

Research Park Dr.
P.O. Box 14052
Lexington, KY 40512-4052
Ph: 606-288-4960
Fax: 606-288-4999
Internet: www.asphaltinstitute.org
e-mail: asphalti@asphaltinstitute.org

ASSOCIATION OF IRON AND STEEL ENGINEERS (AISE)

Three Gateway Center, Suite 1900
Pittsburg, PA 15222-1004
Ph: 412-281-6323

CALIFORNIA DEPARTMENT OF TRANSPORTATION (CDT)

Publication Distributiopn Unit
1900 Royal Oaks Dr.
Sacramento, CA 95815
Ph: 800-553-3520 or 916-227-7000 (CA Transportation Lab)
Fax: 916-324-8997

CAST IRON SOIL PIPE INSTITUTE (CISPI)

5959 Shallowford Rd., Suite 419
Chattanooga, TN 37421
Ph: 423-892-0137
Fax: 423-892-0817

CODE OF FEDERAL REGULATIONS (CFR)

Order from:
Government Printing Office
Washington, DC 20402
Ph: 202-512-1800
Fax: 202-275-7703
Internet: <http://www.pls.com:8001/his/cfr.html>

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

933 No. Plum Grove Rd.
Schaumburg, IL 60173-4758
Ph: 847-517-1200
Fax: 847-517-1206
Internet: <http://www.crsi.org>

CONSUMER PRODUCT SAFETY COMMISSION (CPSC)

Washington, DC 20207
Ph: 301-504-0580

CORPS OF ENGINEERS (COE)

Order from:
U.S. Army Engineer Waterways Experiment Station
ATTN: Technical Report Distribution Section
Services Branch, TIC
3909 Halls Ferry Rd.
Vicksburg, MS 39180-6199

Ph: 601-634-2571
Fax: 601-634-2506

DEPARTMENT OF AGRICULTURE (USDA)

14TH STREET & INDEPENDENCE AVE. S.W.
WASHINGTON, D.C. 20250
Ph: (202) 720-2791
Publications: 301-344-2340

DEPARTMENT OF COMMERCE (DOC)

Order From:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Ph: 703-605-6000
Fax: 703-605-6900
Internet: <http://www.ntis.gov>

DEPARTMENT OF DEFENSE (DOD)

Order from:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Ph: 703-487-4650
FAX: 703-321-8547

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

245 Riverchase Parkway East, Suite 0
Birmingham, AL 35244-1856
Ph: 205-402-8700
Fax: 205-402-8730
Internet: www.diprn.org

ENGINEERING MANUALS (EM)

USACE Publications Depot
ATTN: CEIM-SP-D
2803 52nd Avenue
Hyattsville, MD 20781-1102
Ph: 301-394-0081

ENGINEERING PAMPHLETS (EP)

USACE Publications Depot
ATTN: CEIM-SP-D
2803 52nd Avenue
Hyattsville, MD 20781-1102
Ph: 301-394-0081

ENGINEERING REGULATIONS (ER)

USACE Publications Depot
ATTN: CEIM-SP-D 2803 52nd Avenue
Hyattsville, MD 20781-1102
Ph: 301-394-0081

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Public Information Center
401 M St., SW
Washington, DC 20460
Ph: 800-490-9198
FAX: 202-260-6257
Internet: <http://www.epa.gov>
NOTE: Some documents are available only from:
National Technical Information Services (NTIS)
5285 Port Royal Rd.
Springfield, VA 22161
Ph: 800-553-6847
Fax: 703-321-8547
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-- End of Section --

SECTION 01451A

CONTRACTOR QUALITY CONTROL
07/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(2001) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(2000b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

3.2 QUALITY CONTROL PLAN

The Contractor shall furnish for review by the Government, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 60 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.1 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)
- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

The QC Plan items above shall include RMS QC Requirements.

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 14 calendar days prior to the Coordination Meeting.

During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

This contract will include the demolition and reconstruction of a large segment of the West Parking Apron and partial (and full) removal of existing box drains. The work will be accomplished in very close proximity to flight and training operations. The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety

and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, show drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer or a graduate of construction management, with a minimum of 7 years construction experience on construction similar to this contract or a construction person with a minimum of 10 years in related work.] This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: electrical, civil or structural, materials technician, submittals clerk. These individuals shall be directly employed by the prime Contractor and may not be employed by a supplier or sub-contractor on this project; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals [shall have no other duties other than quality control may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.

Experience Matrix

Area	Qualifications
a. Civil	Graduate Civil Engineer with 5 years experience in the type of work being performed on this project or technician with 5 yrs related experience

Experience Matrix

	Area	Qualifications
b.	Submittals	Submittal Clerk with 3 yr experience
c.	Concrete, Pavements and Soils	Materials Technician with 5 yrs experience for the appropriate area

3.4.4 Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors". This course is periodically offered by the Corps of Engineers. Specific times and locations are available from the Contracting Officer.

3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.

- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Discussion of the initial control phase.
- k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

- f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the

sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer within 24 hours of completing the tests. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the Special Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. A punch list of items which do not conform to the approved drawings and specifications shall be prepared and included in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final

inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.
- g. Offsite surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and

instructions or corrective actions.

- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 SAMPLE FORMS

Sample forms enclosed at the end of this section.

3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

-- End of Section --

SECTION 01500A

TEMPORARY CONSTRUCTION FACILITIES

02/97

1.1 GENERAL REQUIREMENTS

1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of designated area to be fenced, regraded, stoned and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified.

1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee, and for requiring each employee engaged on the work to display, identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site, see Project Location Map (G-001).

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract.

1.2.2 Temporary Connections

The Contractor, in a manner satisfactory to the Contracting Officer, shall provide and maintain necessary temporary connections and distribution lines. The Contractor shall notify the Contracting Officer, in writing, 5 working days before making final electrical connections.

1.2.3 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.2.4 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

1.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1 Bulletin Board

Immediately after receipt of the notice to proceed, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer.

Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the Contractor.

1.3.2 Project and Safety Signs

The requirements for the signs, their content, and location shall be as directed by CO Project and safety sign details shown on drawings. The signs shall be erected within 15 days after receipt of the notice to proceed. The data required by the safety sign shall be corrected daily, with light colored metallic or non-metallic numerals. Upon completion of the project, the signs shall be removed from the site.

1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.4.1 Protection and Continuity of Traffic

The contractor will insure Flightline Vehicle traffic will be maintained in both directions and on a paved surface only. Vehicle traffic will not be allowed to leave the paved surface due to FOD Foreign Object Damage to aircraft engines. Flightline Road must be temporarily relocated during construction. Contractor to schedule movement of equipment, materials such that there is always total road access to the Base Ops facility and the LO CRF site (nearby on-going construction projects) at all times.

1.4.2 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust and foreign object (FOD) control, shall be adequate to ensure safe operation at all times. FOD shaker assemblies shall be installed at strategic locations by the contractor. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

1.4.3 Barricades

The Contractor shall erect and maintain temporary traffic control and safety barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night. Barricades and other physical protection shall be in accordance with EM 385-1-1.

1.5 CONTRACTOR'S TEMPORARY FACILITIES

1.5.1 Administrative Field Offices and Storage Areas

The Contractor shall provide and maintain administrative field office trailer located in the staging area at the designated site. The field office shall meet LAFB requirements for such facilities.

1.5.2 Storage Area

The Contractor shall construct a temporary 6 foot high chain link fence and a foreign object deflection (FOD) fence around trailers and materials. The fence shall include tennis court fabric Brown, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the military boundaries. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area at the end of each work day. Contractor to provide COR with key(s) to gated/locked facilities.

1.5.3 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair and shall meet LAFB requirements for temporary

office facilities.. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the air base property.

1.5.4 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

1.5.5 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment.

1.6 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, the Contractor shall furnish and erect temporary project safety fencing at the work site. The safety fencing shall be a high visibility orange colored, a 3' high ,with weighted barrels and flashing lights on the north and west sides of project. The safety fencing shall be maintained by the Contractor during the life of the contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

1.7 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away immediately. Materials resulting from demolition activities which are salvageable shall be removed from the base. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when temporarily stored.

1.8 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or preconstruction condition. Gravel, drain pipes used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 01572

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

10/01

1.1 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy the Contractor shall: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

1.2 MANAGEMENT

The Contractor shall take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling shall accrue to the Contractor. Firms and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by federal, state, and local regulations.

1.3 PLAN

A waste management plan shall be submitted within 15 days after notice to proceed. The plan shall include the following:

- a. Name of individuals on the Contractor's staff responsible for waste prevention and management.
- b. Actions that will be taken to reduce solid waste generation.
- c. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas and equipment to be used for processing, sorting, and temporary storage of wastes.
- d. Characterization, including estimated types and quantities, of the waste to be generated.
- e. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.
- f. Identification of local and regional reuse programs, including

non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.

g. List of specific waste materials that will be salvaged for resale, salvaged and reused, or recycled. Recycling facilities that will be used shall be identified.

h. Identification of materials that cannot be recycled/reused with an explanation or justification.

i. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

1.4 RECORDS

Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. The records shall be made available to the Contracting Officer and Langley Air Force Base Coordinator for Recycled materials. Weight (scale) tickets shall be provided for waste materials (concrete and steel) Removed from LAFB during construction, and a copy of the records shall be delivered to the Contracting Officer upon completion of the construction.

1.5 COLLECTION

See notes on drawings and demolition specifications for additional requirements. Recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials and separated by one of the following methods:

1.5.1 Source Separated Method.

Waste products and materials that are recyclable shall be separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing.

1.5.2 Co-Mingled Method.

Waste products and recyclable materials shall be placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed.

1.5.3 Other Methods.

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.6 DISPOSAL

Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:

1.6.1 Reuse.

First consideration shall be given to salvage for reuse since little or no

re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.

1.6.2 Recycle.

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible. Recycled concrete as base course material or spot reinforcement/bridging material shall not be used on this project. Contractor is encouraged to deliver demolition concrete to concrete recycler.

1.6.3 Waste.

Materials with no practical use or economic benefit shall be disposed at a landfill or incinerator.

-- End of Section --

SECTION 01780A

CLOSEOUT SUBMITTALS

11/99

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

As-Built Drawings; GE, RE

Drawings showing final as-built conditions of the project. The final CADD as-built drawings shall consist of one set of electronic CADD drawing files in the specified format, one set of mylar drawings, 2 sets of blue-line prints of the mylars, and one set of the approved working as-built drawings.

SD-03 Product Data

As-Built Record of Project Components and Materials; G, RE

Two copies of the record listing the as-built project components and materials and equipment incorporated into the construction of the project.

Warranty Management Plan; G, RE

4 sets of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. The Contractor shall furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

Warranty Tags; G, RE

Two record copies of the warranty tags showing the layout and design.

Final Cleaning; G

Two copies of the listing of completed final clean-up items.

1.2 PROJECT RECORD DOCUMENTS

1.2.1 As-Built Drawings

This paragraph covers as-built drawings complete, as a requirement of the

contract. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings.

1.2.1.1 Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring CADD file as-built drawings.

1.2.1.2 Working As-Built and Final As-Built Drawings

The Contractor shall revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. These working as-built marked drawings shall be kept current on a weekly basis and at least one set shall be available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes.

Final as-built drawings shall be prepared after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (as appropriate for the project). The working as-built marked prints and final as-built drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final as-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings. The working and final as-built drawings shall show, but shall not be limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines, expansion and contraction joints, box drains, storm drains, etc. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.

b. The location and dimensions of any changes within the West Apron paving structure.

c. Correct grade, elevations, cross section, or alignment of concrete paving earthwork, structures or utilities if any changes were made from contract plans.

d. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, concrete box drain covers, storm junction box (manholes) covers, pipe sizes, insulation material, dimensions of box drains and junction boxes, etc.

e. The topography, invert elevations and grades of drainage installed

or affected as part of the project construction.

f. Changes or modifications which result from the final inspection.

g. Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built prints.

h. Modifications (change order price shall include the Contractor's cost to change working and final as-built drawings to reflect modifications) and compliance with the following procedures.

- (1) Directions in the modification for posting descriptive changes shall be followed.
- (2) A Modification Circle shall be placed at the location of each deletion.
- (3) For new details or sections which are added to a drawing, a Modification Circle shall be placed by the detail or section title.
- (4) For minor changes, a Modification Circle shall be placed by the area changed on the drawing (each location).
- (5) For major changes to a drawing, a Modification Circle shall be placed by the title of the affected plan, section, or detail at each location.
- (6) For changes to schedules or drawings, a Modification Circle shall be placed either by the schedule heading or by the change in the schedule.
- (7) The Modification Circle size shall be 1/2 inch diameter unless the area where the circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.

1.2.1.3 Drawing Preparation

The as-built drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints shall be neat, legible and accurate. These drawings are part of the permanent records of this project and shall be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the Government.

1.2.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only personnel proficient in the preparation of CADD drawings shall be employed to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings shall be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols shall be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, they shall be prepared using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing

border to be used for any new final as-built drawings shall be identical to that used on the contract drawings. Additions and corrections to the contract drawings shall be accomplished using CADD files. The Contractor will be furnished AutoCad Release 2000 software format. The electronic files will be supplied on compact disc, read-only memory (CD-ROM). The Contractor shall be responsible for providing all program files and hardware necessary to prepare final as-built drawings. The Contracting Officer will review final as-built drawings for accuracy and the Contractor shall make required corrections, changes, additions, and deletions.

a. CADD colors shall follow the color scheme of the original drawing. Layer code for changes shall be as follows:

(1) Deleted Items - Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders and moved to a layer name "DELETED ITEMS" and that layer shall be frozen from plotting.

(2) Added Items - Added items shall be drawn in colors to match the original drawing but shall be placed in a layer called "ITEMS ADDED BY CHANGE ORDER".

(3) Special Items - Items requiring special information, coordination, or special detailing or detailing notes shall follow the drawing color scheme and be placed on a layer called "SPECIAL REQUIREMENTS".

b. The Contract Drawing files shall be renamed in a manner related to the contract number (i.e., 98-C-10.DGN) as instructed in the Pre-Construction conference. Marked-up changes shall be made only to those renamed files. All changes shall be made on the layer/level as the original item. There shall be no deletions of existing lines; existing lines shall be changed to red and moved to the "DELETED ITEMS" layer.

c. When final revisions have been completed, the cover sheet drawing shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in letters at least 3/16 inch high. All other contract drawings shall be marked either "AS-Built" drawing denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions. Original contract drawings shall be dated in the revision block.

d. Within 20 days for contracts less than \$5 million on 20 days for contracts \$5 million and above after Government approval of all of the working as-built drawings for a phase of work, the Contractor shall prepare the final CADD as-built drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Government review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 10 days the Contractor shall revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 20 days of substantial completion of all phases of work, the Contractor shall submit the final as-built drawing package for the entire project. The submittal shall consist of one set of electronic files on compact disc, read-only memory (CD-ROM), one set of mylars, two sets of blue-line prints and one set of the approved working as-built drawings. They shall be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems

incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final as-built drawing files and marked prints as specified shall be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

1.2.1.5 Payment

Separate payment will be made to contractor for as-built drawings required under this contract.

1.2.2 As-Built Record of Equipment and Materials

The Contractor shall furnish 2 copies of preliminary record of equipment and materials used on the project 20 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Two sets of final record of equipment and materials shall be submitted 10 days after final inspection. The designations shall be keyed to the related area depicted on the contract drawings. The record shall list the following data:

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA

Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number	Composition and Size	Where Used
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1.2.3 Final Approved Shop Drawings

The Contractor shall furnish final approved project shop drawings 30 days after transfer of the completed facility.

1.2.4 Construction Contract Specifications

The Contractor shall furnish final as-built construction contract specifications, including modifications thereto, 30 days after transfer of the completed facility.

1.2.5 Real Property Equipment

The Contractor shall furnish a list of installed equipment furnished under this contract. This list shall be maintained in RMS. The list shall include all information usually listed on manufacturer's name plate. The "EQUIPMENT-IN-PLACE LIST" shall include, as applicable, the following for each piece of equipment installed: description of item, location, capacity, name and address of manufacturer, name and address of equipment supplier, condition, manufacturer's catalog, and warranty. A draft list shall be furnished at time of transfer. The final list shall be furnished 30 days before beneficial occupancy.

1.3 WARRANTY MANAGEMENT

1.3.1 Warranty Management Plan

The Contractor shall develop a warranty management plan which shall contain information relevant to the clause Warranty of Construction in 00700. At

least 30 days before the planned pre-warranty conference, the Contractor shall submit the warranty management plan for Government approval. The warranty management plan shall include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase shall be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Approved information shall be assembled in a binder and shall be turned over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. A joint 4 month and 9 month warranty inspection shall be conducted, measured from time of acceptance, by the Contractor, Contracting Officer and the Customer Representative. Information contained in the warranty management plan shall include, but shall not be limited to, the following:

a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.

b. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include concrete (aircraft) paving, joint system, junction box covers, static grounding/mooring devices for aircraft protection systems, etc. Warranty tags (certificates) to be delivered to COR.

c. A list for each warranted equipment, item, feature of construction or system indicating:

1. Name of item.
2. Model and serial numbers.
3. Location where installed.
4. Name and phone numbers of manufacturers or suppliers.
5. Names, addresses and telephone numbers of sources of spare parts.
6. Warranties and terms of warranty. This shall include one-year overall warranty of construction. Items which have extended warranties shall be indicated with separate warranty expiration dates.
7. Cross-reference to warranty certificates as applicable.
8. Starting point and duration of warranty period.
9. Summary of maintenance procedures required to continue the warranty in force.
10. Cross-reference to specific pertinent Operation and Maintenance manuals.
11. Organization, names and phone numbers of persons to call for warranty service.
12. Typical response time and repair time expected for various warranted equipment.

d. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

e. Procedure and status of tagging of all equipment covered by

extended warranties.

f. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.3.2 Performance Bond

The Contractor's Performance Bond shall remain effective throughout the construction period.

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.

c. Following oral or written notification of required construction warranty repair work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.3.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor shall furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, shall be continuously available, and shall be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.3.4 Contractor's Response to Construction Warranty Service Requirements

Following oral or written notification by the Contracting Officer, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. The Contractor shall submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframes specified, the Government will perform the work and backcharge the

construction warranty payment item established.

a. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

b. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

c. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.

d. The "Construction Warranty Service Priority List" is as follows:

Code 3-Electrical

Aircraft grounding and mooring devices/system.

Code 2-Concrete Pavement Distress (cracking/spalling)

Where major damage to property is not occurring, check for locations of cracking/spalling and complete repairs on a Code 2 basis.

Code 3-All other work not listed above.

1.3.5 Warranty Tags

At the time of installation, each warranted item shall be tagged with a durable, oil and water resistant tag approved by the Contracting Officer. Each tag shall be attached with a copper wire and shall be sprayed with a silicone waterproof coating. The date of acceptance and the QC signature shall remain blank until project is accepted for beneficial occupancy. The tag shall show the following information.

- a. Type of product/material_____.
- b. Model number_____.
- c. Serial number_____.
- d. Contract number_____.
- e. Warranty period_____ from_____ to_____.
- f. Inspector's signature_____.
- g. Construction Contractor_____.
- Address_____.
- Telephone number_____.
- h. Warranty contact_____.
- Address_____.
- Telephone number_____.
- i. Warranty response time priority code_____.

j. WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.

1.4 FINAL CLEANING

The premises shall be left broom clean. Stains, foreign substances and objects, and temporary labels shall be removed from surfaces. Debris shall be removed from drainage systems. Paved areas shall be swept clean. The site shall have waste, surplus materials, and rubbish removed. The project area shall have temporary structures, barricades, project signs, and construction facilities removed. A list of completed clean-up items shall be submitted on the day of final inspection.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01850

CONTRACT DRAWINGS

03/98

NORFOLK DISTRICT

SHEET NUMBER

TITLE

T-001	DRAWING INDEX, ABBREVIATIONS AND MAPS
G-001	PROJECT LOCATION MAP, ACCESS AND SAFETY NOTES
C-401	EXISTING SITE CONDITIONS
C-402	EXISTING PAVEMENT DEMOLITION PLAN
C-403	NEW PAVEMENT LAYOUT PLAN
C-404	SITE GRADING / PLAN DRAINAGE
C-405	PAVEMENT MARKING PLAN
C-501	PAVEMENT DETAILS
C-502	PAVEMENT AND STORM DRAINAGE DETAILS
C-503	STORM DRAINAGE DETAILS
E-101	WEST APRON-MOORING/GROUNDING ANCHOR LAYOUT PLAN
E-102	MOORING/GROUNDING ANCHOR DETAILS
G-401	GEO IRP 26 SITE
G-501	GEO IRP 26 DETAIL

-- End of Section --

SECTION 02060

WELL AND PIEZOMETER ABANDONMENT

06/02

PART 1 GENERAL

1.1 APPLICABLE STANDARDS AND PUBLICATIONS.

The following publications of these issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1.1 American Society for Testing and Materials (ASTM) Publications

C 150-86 Standard Specification for Portland Cement

1.1.2 American Petroleum Institute (API) Publications.

API SPEC 13A Specification for Drilling?Fluid Materials

1.1.3 U.S. Army Corps of Engineers Engineering and Design Manual

EM1110-1-4000 (1 Nov 98): Monitoring Well Design, Installation and Documentation at Hazardous, Toxic, and Radioactive Waste Sites (Section 3.13)

1.2 SCOPE

The work provided for herein consists of furnishing all plant, labor, fuels, lubricants, electric energy, materials and equipment, and performing all operations required for the abandonment of ground water monitoring wells as indicated on the drawings and as specified herein.

1.3 QUALITY CONTROL

The Contractor shall establish and maintain quality control for all well abandonments to assure compliance with contract requirements. The Contractor shall maintain records of his quality control for well abandonment, including but not limited to the items listed in paragraph: SUBMITTALS.

1.4 PROTECTION OF EXISTING FACILITIES

The Contractor shall protect all surface and subsurface structures and surrounding areas from damage which may result from the methods employed in performing this work. The Contractor shall be responsible for any damages to such structures resulting from his operations. Damaged property shall be repaired or replaced at no additional cost to the Government, to a condition which is equal to that which existed prior to the damage. The Contracting Officer shall have the right to approve these restoration measures.

1.5 DOCUMENTATION

For each monitoring well, piezometer, or soil gas well, the documents outlined below shall be completed.

1.5.1 Abandonment Diagrams/Logs.

An abandonment diagram/log shall be completed for each well and piezometer abandonment. The scale of the diagram shall be 1 inch equals 4 feet. The diagram shall be prepared by the geologist/hydrogeologist present during well abandonment operations. Submission of the diagram shall be a Category II (Approval) submittal within 5 working days of the completion of each well or piezometer abandonment. The well or piezometer abandonment will not be accepted by the Contracting Officer's Representative before the abandonment diagrams are received. The diagram shall illustrate the as-built condition of the abandonment and include, but not be limited to, the following items, as per EM 1110-1-4000:

- a. Name of the project and site.
- b. Well identification number and location (coordinates).
- c. Name of driller and name and signature of hydrogeologist preparing diagram.
- d. Date(s) of abandonment.
- e. Original construction.
 - Description of material from which the well or piezometer is constructed.
 - Copy of the boring log, if available.
 - Copy of construction diagram for abandoned well, if available.
 - Nominal hole diameter.
- f. Abandonment data.
 - Date(s) of abandonment operations.
 - Depth to water and date measured.
 - Diameter of abandonment boring.
 - Depth of abandonment boring.
 - Disposition of materials removed/displaced from decommissioned boring/well; e.g., casing, objects, soil, and groundwater.
 - Casing or items left in hole by depth, description, composition, and size, if available.
 - Method of grouting.
 - Date, description (grout type, mixture-include water, and weight per gallon) and total quantity of grout used initially, and any added to compensate for settlement..
 - Top and bottom elevations of grout.- Report all depths/heights from ground surface.

1.5.2 Field Notebook

A field notebook shall be kept by the geologist/ hydrogeologist present during well abandonment operations. Information recorded in the book shall include, but not be limited to the following:

- Identification number.
- To the extent known or measurable, boring depth and diameter; surface and well casing interval, diameter and materials; screen

interval, diameter and materials; seal interval and materials.

- Description of abandoned well including boring diameter and depth; grout intervals.
- Description of abandonment methods.
- Significant observations made during abandonment.
- Record of materials used during abandonment operations.
- Geologic and mechanical problems encountered during well abandonment.
- Weather conditions.
- Personnel present and visitors to the site.
- Other information.
- Daily start up and completion times.
- Date and sign off by geologist/geohydrologist.

1.6 SUBMITTALS.

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01305 SUBMITTAL PROCEDURES:

SD-01 Data

Abandonment Plan;GA

A plan describing methods and procedures to be used for abandonment shall be submitted. The plan must be prepared by, or approved and signed by a geologist/hydrogeologist before submittal. The plan shall include, but not be limited to the following:

- Description of well procedures including drilling and placement of grout.
- Description of drilling equipment.
- Description of abandonment material.
- Description of quality control procedures including depth measurements, placement of grout. Also include example forms for abandonment diagrams/logs.

Abandonment diagrams/logs;GA

Field notebook;GA

PART 2 PRODUCTS

2.1 GROUT

Grout for abandonment shall consist of a mixture of 94 pounds of Type II Portland cement, 3 to 5 pounds of powdered bentonite and a maximum of 7 gallons of water. Bentonite shall be Wyoming type sodium montmorillonite and shall meet the requirements of API SPEC 13A, Section 5. Cement shall meet the requirements of ASTM C 150 86.

PART 3 EXECUTION

3.1 ABANDONMENT SCHEDULING

Abandonment operations shall be completed before any excavation or embankment activities are performed on site.

3.2 WELLS AND PIEZOMETERS TO BE ABANDONED

Wells and piezometers to be abandoned are constructed of 2 inch, schedule 40 PVC casing and well screen. The locations and pertinent construction details of the wells to be abandoned are shown in the drawings.

3.3 GOVERNMENT FURNISHED DATA

Well logs and/or well installation diagrams will be furnished to the Contractor for the wells if available. These data shall be used by the Contractor to assist in completing the requirements of Section: Abandonment Diagrams/Logs.

3.4 ABANDONMENT PROCEDURES

3.4.1 Monitoring Wells.

The following procedures shall be followed.

3.4.1.1 Water Levels and Depth Measurements

The majority of the monitoring wells requiring abandonment and located within the project limits, have been filled with sand and capped with bentonite. Where possible, water levels shall be measured prior to abandonment operations. In addition, where possible, the total depth of the monitoring well shall be determined.

3.4.1.2 Preparing Monitoring Wells for Abandonment

There are 11 wells that require abandonment under this contract. There are 8 wells, within the project limits, that will be abandoned by others, prior to beginning this contract. The 11 wells that require abandonment under this contract are: OW-94, OW-93, MW-CT-8a, MW-CT-8b, OW-55, OW-41, OW-56, OW-40, OW-28a, OW-28b, & OW-30. The Contractor shall assume all wells to be constructed of an 8-inch bore hole, with a total depth of 12 feet below ground surface. The casing is constructed of 2-inch PVC pipe with a 10 foot screen interval. The concrete pad is approximately 9-inches by 9-inches. Since the majority of the monitoring wells have already been backfilled with sand and capped with bentonite, complete plugging of the monitoring well can not be achieved without redrilling the borehole. Prior to redrilling the borehole, the contractor shall remove the protective cover, concrete pad, PVC well casing pipe, and any adjacent pavement necessary to adequately access the well. The Contractor shall then redrill the borehole, utilizing an auger sized appropriately to ensure the borehole has been redrilled to the original depth and diameter of the original borehole. Once the borehole has been redrilled and with the augers still in place, the contractor shall insert a tremie pipe and backfill in accordance with the following paragraph 3.4.1.3 Backfilling. Redrilling of the borehole shall occur in a manner that ensures there are no obstructions in the borehole, that may hamper the placement of the grout. Use of a plug, while redrilling is a requirement, and it is the responsibility of the Contractor to remove any obstructions or material that was deposited in the borehole during redrilling, prior to backfilling the borehole.

3.4.1.3 Backfilling

The borehole formed by redrilling, shall be sealed by backfilling under pressure with cement bentonite grout. Grout shall be placed through a side discharge tremie pipe, which is lowered down the inside of the borehole to within three feet of the bottom. Note, the new subgrade elevation (top of base course just below the pavement section) will be approximately 8" below

the current subgrade elevation, due to the fact that the new pavement section will be approximately 8" thicker than the current pavement section.

A volume of grout, equal to the borehole volume, shall be pumped in one continuous operation through the tremie pipe to fill the borehole. The tremie pipe shall be withdrawn from the borehole, while the remaining volume of the borehole is filled with grout to within 6" of the bottom of the base course. Grout shall be added, as necessary, to maintain the grout level in the borehole within 6" of the proposed base course elevation.

3.4.1.4 Surface Completion

Grout shall be allowed to set a minimum of 24 hours before backfilling the remaining portion of the borehole, with suitable soil, in accordance with Specification Section 02300 Earthwork.

3.4.1.5 Liquids

All liquids produced during well abandonment operations (i.e. ground water purged during grouting) will be considered contaminated. Liquids will be contained to prevent runoff and saturation into the soils. The liquids will be disposed of in accordance with SECTION 02072 EXCAVATION OF PETROLEUM CONTAMINATE SOIL.

3.4.1.6 Drill Cuttings

Drill cuttings produced during drilling operations will be considered contaminated. Cuttings will be disposed of in accordance with SECTION 02072 EXCAVATION OF PETROLEUM CONTAMINATE SOIL.

3.5 GROUT PLACEMENT

The grout shall be placed by tremie pipe, unless specified otherwise, submerged in the grout at all times. The tremie pipe may be raised as the grout is placed as long as the discharge end remains submerged in the grout. The tremie pipe shall be constructed so as to direct the flow of grout to the sides rather than downward. The hollow stem auger shall be withdrawn from the bottom of the well as the grout is placed. The grout shall be placed from the bottom to the top of the hole in one continuous operation.

-- End of Section --

SECTION 02072
EXCAVATION OF PETROLEUM CONTAMINATED SOIL

03/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referenced in the text by basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API Publ 2217 (Jun 1984; 1st Ed) Guidelines for Confined Space Work in the Petroleum Industry

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556 (1990) Density of Soil in Place by the Sand-Cone Method

ASTM D 1557 (1978; R 1990) Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-inch (457-mm) Drop

ASTM D 2167 (1984; R 1990) Density and Unit Weight of Soil in Place by Rubber Balloon Method

ASTM D 2487 (1990) Classification of Soils for Engineering Purposes

ASTM D 2922 (1981; R 1990) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 3017 (1988) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

CODE OF FEDERAL REGULATIONS (CFR)

CFR 29 Part 1910.120 Hazardous Waste Operations and Emergency Response

CFR 40 Part 261 Identification and Listing of Hazardous Waste

CFR 40 Part 262 Standards Applicable to Generators of Hazardous Waste

CFR 40 Part 263 Standards Applicable to Transporters of Hazardous Waste

CFR 40 Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and

Disposal Facilities

CFR 40 Part 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage , and Disposal Facilities
CFR 40 Part 266	Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities
40 CFR 401	Effluent Guidelines and Standards
40 CFR 403	General Pretreatment Regulations for Existing and New sources of Pollution
CFR 49 Part 172	Hazardous Materials Tables
49 CFR 178	Specifications for Packaging
CFR 49 Part 302	List of Hazardous Substances and Reportable Quantities

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846	(Nov 1986, 3rd Ed) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II)
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U.S. ARMY CORPS OF ENGINEERS (COE)

ER 1110-1-263	Chemical Data Quality Management for Hazardous Waste Remedial Activities
ER 385-1-92	Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities
EM 385-1-1	(1996) Safety and Health Requirements Manual
EM 200-1-1	(1994) Validation of Analytical Chemistry Laboratories
EM 200-1-3	(Sep 94) Requirements for the Preparation of Sampling and Analysis Plans
EM 200-1-6	(1997) Chemical Quality Assurance

COMMONWEALTH OF VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

9VAC 20-60	Hazardous Waste Management Regulations
9VAC 20-80	Solid Waste Management Regulations
9VAC 20-110	Regulations Governing the Transportation of Hazardous Materials
9VAC 25-31	Virginia VPDES General Permit

9VAC 25-180

VPDES Permit for Stormwater
Discharge-Construction Sites

9VAC 25-260

Virginia Water Quality Standards

1.2 MEASUREMENT AND PAYMENT

1.2.1 Measurement and Payment of Potentially Contaminated Soil

All costs associated with the stockpiling, and characterization of the potentially contaminated soil, in accordance with applicable Federal and State Regulations shall be paid for under the unit price established in the bid schedule.

Potentially contaminated soil, that requires stockpiling and characterization shall be measured in 100 cubic yards stockpiles.

All costs associated with the transportation and disposal of confirmed contaminated soil shall be paid for under a separate unit price, as established in the bid schedule. The definition of confirmed contaminated is any material that exceeds VDEQ guidance for clean fill, as outlined in the Virginia Solid Waste Management Regulations, 9 VAC 20-80.

Petroleum contaminated soil, requiring transportation and disposal off site, to a permitted facility shall be measured in tons, based on weigh tickets from the disposal facility.

1.2.1.1 Measurement and Payment of Potentially Contaminated Groundwater

All costs associated with containerization and characterization of potentially contaminated dewatered groundwater shall be paid for under the unit price established in the bid schedule.

All costs associated with the transportation and disposal of confirmed contaminated dewatered groundwater shall be paid for under the unit price established in the bid schedule.

1.2.2 Payment

Compensation for work covered by this section will be in accordance with the bid schedule.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Work Plan; GA

The Contractor shall develop, implement, maintain, and supervise as part of the work, a comprehensive plan for contaminated soil removal, stockpiling, testing, treatment & disposal, and related operations. The Work Plan shall demonstrate compliance with the contract clauses, referenced standards, this specification, ER 1110-1-263, ER 385-1-92, EM 385-1-1, 9VAC 20-60, 9VAC 20-80, 9VAC 20-110, 9VAC 25-260, and CFR 29 Part 1910.120. No work at the site, with the exception of site inspections and mobilization, shall be

performed until the plan is approved. At a minimum the Work Plan shall include:

- a. Scheduling and operational sequencing of all work associated with excavations to be performed in areas of known or potential contamination.
- b. Description of the excavation, screening for contamination, stockpiling, and disposal procedures. This shall include a detailed drawing, identifying the location of all excavations and stockpiling activities and all exclusion zones, contamination reduction zones, and support zones associated with planned excavations.
- c. A Sampling and Analysis Plan, in accordance with ER 1110-1-263, EM 200-1-1, EM 200-1-3, and EM 200-1-6 which describes field screening and sampling methods and applicable quality control procedures, and which lists analysis parameters, EPA SW-846 or other applicable methods, and selected laboratory or laboratories including qualifications and quality assurance/control procedures.
- d. Identification of applicable regulatory requirements and permits.
- e. Methods to be employed for contaminated water removal, storage, sediment removal and treatment, and discharge or disposal, and methods proposed for control of surface water. For on-site sediment removal and treatment, full details of unit process(es), a proposed layout/staging including pumping and piping, manufacturer's operating instructions, and certification of compliance with applicable VDEQ, federal and local regulations, shall be submitted.
- f. Identification of [waste] [and] [contaminated soil] transporters and means of transportation and a copy of all State and/or Federal License for hauling .
- g. Disposal facilities and alternate disposal facilities and means of disposal or remediation and a copy of all State and/or Federal Permits for treatment and disposal of waste and contaminated soil.
- h. Borrow source.
- i. Spill prevention plan.
- j. Spill contingency plan.
- k. Decontamination procedures.
- l. Methods of measuring [weight][volume] of contaminated soil for disposal [and volume of contaminated water for treatment or disposal].
- m. A statement of agreement from each transporter, and from each treatment, storage, and disposal facility operator to accept the specific waste from this work.

Site Health and Safety Plan GA

There is potential for workers at the site to be exposed to petroleum constituents during excavation and handling. Pursuant to regulations issued by CFR 29 Part 1910.120, the Contractor shall take appropriate measures to safeguard the health of workers at the site. Such

measures include apprising workers of the nature of the contaminants at the site, ensuring workers have appropriate training for working at contaminated sites, and preparing and conducting work in accordance with a site specific health and safety plan. The Contractor shall prepare a health and safety plan, in accordance with CFR 29 Part 1910.120, EM 385-1-1, and ER 385-1-92, which addresses all aspects of worker notification, training, exposure, protective equipment, and other protection at the site. SD-09 Reports

SD-06

Test Reports; FIO.

Test results stockpiled for potentially contaminated soil and discharged water. The reports shall include the chain-of-custody records.

SD-07 Certificates

Qualifications; GA

A statement demonstrating that the Contractor meets the requirements in paragraph QUALIFICATIONS. Include owner, owner point of contact with phone number, location of worksite, and dates of previous projects.

Permits; FIO.

Provide copies of permits for transporting, storing, treating, and disposal of wastes.

SD-11 Closeout Submittals

Shipping Manifest; FIO.

Manifest in accordance with CFR 40 Part 262 Section 23, and CFR 40 PART 263 [and 9VAC 20-60 and 9VAC 20-110].

Final records and documentation of treatment or disposal in accordance with paragraph CONTAMINATED SOIL DISPOSAL GUIDELINES and paragraph DOCUMENTATION OF TREATMENT OR DISPOSAL.

1.4 QUALIFICATIONS

The Contractor performing excavation in potentially contaminated soil shall have a minimum of two years experience in the removal and disposal of petroleum contaminated soil.

1.5 NOTIFICATION

The Contractor shall notify the Contracting Officer (CO) immediately after a suspected contaminant beyond that indicated is encountered.

1.6 AVAILABLE DATA

In Sept. and Oct. 2002, representatives from the Norfolk District GeoEnvironmental Section and IMS Environmental collected 41 soil samples and one groundwater sample at the site of the F-22 West Apron Pavement Replacement Project. The soil samples were screened, in the field, utilizing a Photionization Detector and a Flame Ionization Detector (FID), in order to decide which samples should be analyzed for the presence of petroleum. Based on the PID/FID results, 22 samples were sent Accutest

Laboratories, Inc. for analysis of TPH-DRO and BTEX. The analyses indicated that total BTEX ranged from non-detect to 170.8 ppb, and TPH (JP-8) ranged from non-detect to 2910 ppm. A copy of the report is provided as an attachment to these specifications.

In addition, based on the field screening results, one groundwater sample was collected from monitoring well OW-28A. The analyses indicated the presence of TPH (JP-8) at a concentration of 2.57 ppm and Naphthalene at a concentration of 3.8 ppb.

Based on the available data, the Contractor shall consider all soil excavated in the vicinity of the existing box drain, contaminated until characterization proves otherwise. In addition, the Contractor shall screen in the field, per this specification, all excavations necessary to install the new pavement section. Contractor shall review available data, and perform excavation in a manner that limits the potential for contaminated soil coming in contact with uncontaminated soil.

Additionally, all dewatered groundwater shall be considered contaminated and shall be containerized and characterized prior to discharge on-site or disposal off site. Characterization shall be in accordance with criteria established in Virginia Administrative Code 9VAC25-120-80. In the event the analyses indicates the water exceeds the criteria for on-site discharge, the Contractor shall be required to get all permits necessary for on-site treatment or off site disposal, at a permitted facility. Any water that meets the requirements of 9VAC 25-120 for Saltwater Receiving Waters and VPDES permit per 9VAC 25-31 and 9VAC 25-180, may be discharged into the storm water drainage system at the site.

1.6.1 ENVIRONMENTAL PROTECTION

The Contractor shall take necessary measures specified herein, shown in Section 01560, and otherwise required, to protect the environment.

PART 2 PRODUCTS

2.1 BACKFILL MATERIAL

Backfill material shall meet the applicable soils classifications as specified in Section 02300 Earthwork.

2.2 CONTAINER FOR HAZARDOUS WASTE

Container for hazardous waste shall comply with 49 CFR 178.

PART 3 EXECUTION

3.1 SAFETY

Personnel working inside and in the general vicinity of the excavation shall be trained and thoroughly familiar with the safety precautions, procedures, and equipment required for controlling potential hazards associated with this work. Personnel shall use proper protection and safety equipment during work in and around the excavation in accordance with the approved Site Health and Safety Plan, and as otherwise specified.

3.2 SOIL EXAMINATION, TESTING, AND ANALYSIS

3.2.1 Soil Examination

The Contractor shall examine the soil within the project site and shall immediately notify the CO of suspected soil contamination beyond that indicated in the attached environmental investigation report, and all work within the area of suspected contamination shall be stopped as soon as practicable. As soon as practicable is defined as securing and protecting all open trenches and equipment, and providing measures to prevent contamination of other soil or water. The Contractor shall not perform any additional work in the area of suspected contamination, until notified, in writing, by the CO.

3.2.2 Stockpiled Material Sampling

Stockpiled suspected contaminated soil shall be sampled [in accordance with 9VAC 20-80], and preserved in accordance with EPA SW-846. For VOC analysis, a minimum of one discrete sample shall be collected from within the stockpile.

3.2.3 Testing and Analysis

Soil samples from the excavation and stockpiled material shall be tested in accordance with EPA SW-846, 9VAC 20-60, and 9VAC 20-80, as modified herein for the following:

- a. GRO/TPH by EPA Method 5035/8015 modified;
- b. DRO/TPH by EPA Method 3550/8015 modified;
- c. Benzene, ethylbenzene, toluene, xylene (BTEX) by EPA Method 5035/8021B;
- d. toxicity characteristic leaching procedure (TCLP) by EPA Method 1311 [for lead by EPA Method 6010/7000] and [testing by appropriate EPA Method for (list any other known toxic constituents here)];
- e. Total organic halogens (TOX) by EPA method 9020;
- f. Paint filter liquids by EPA Method 9095;
- g. All additional analyses as may be required by the approved off-site disposal facility.

3.2.4 Test Reports

Copies of all test results shall be provided to the CO. The testing laboratory and Contractor shall adhere to the quality control program, including spikes, blanks, and duplicates, of EPA SW-846 and 200-1-3. All additional testing required by the disposal or treatment facility shall be at the Contractor's expense.

3.3 EXCAVATION

3.3.1 Open Excavations

Open excavations and stockpile areas shall be secured while awaiting test results. The excavation shall not be backfilled without approval from the CO. The Contractor shall divert surface water around excavations to prevent water from directly entering into the excavation.

3.3.2 Stockpiles

a. Monitoring Excavated Material

Excavation shall be performed in a manner that will limit the amount of potentially contaminated soil that could be mixed with previously uncontaminated soil. Suitable uncontaminated, excavated soil shall be deposited adjacent to the excavation, and shall be used for backfill prior to using borrow material. Continuous monitoring of all excavation work shall be accomplished with an organic vapor analyzer photoionization device or flame ionization detector (OVA/PID/FID) capable of detecting volatile, semi-volatile and organic vapors to a minimum of one part per million (ppm).

b. Stained, Volatile, and/or Odorous Excavated Material

Excavated material which is visibly stained or for which real time vapor monitoring instrument readings exceed background levels by more than 10 ppm for volatile and semi-volatile hydrocarbons and which has an obvious petroleum odor shall be considered contaminated and shall be stockpiled for sampling in accordance with paragraph STOCKPILED MATERIAL SAMPLING.

c. Stockpiling Contaminated Soil

Contaminated soil shall be placed on an impermeable geomembrane a minimum of 20 mils thick or on two (2) layers each a minimum of 10 mils thick, and covered with a 10 mil sheet of geomembrane as specified. The geomembrane shall be placed such that the stockpiled soil does not come in contact with surface water run-off. The mil geomembrane cover shall prevent rain or surface water from coming into contact with the contaminated soil, as well as limit the escape of the volatile constituents in the stockpile. Contaminated soil may be stockpiled in sealed roll-offs approved for storage of hazardous waste.

3.3.3 Contaminated Water

Water removed from the excavation shall be considered contaminated until sampling and testing indicate otherwise. The water shall be contained, stored on-site and analyzed prior to being transported, treated, stored, or disposal of. No Government facilities shall be used for storage or disposal of the waste. The Contractor shall be responsible for obtaining all required permits. The Contractor shall provide approved containers, vehicles, equipment, labor, signs, placards, labels, and manifests necessary for accomplishment of the work, including materials necessary for cleaning up spills that could occur from the excavation operation.

3.3.4 Contaminated Water Disposal

a. Sample and Analysis

Contaminated water shall be analyzed, and certified results received, prior to discharge or disposal. Analytical results for water discharged to the storm sewer system or other permitted locations shall be furnished within 72 hours of sample collection, or more frequently if required by the issued permit. Documentation of all analyses performed shall be furnished to the Contracting Officer in accordance with Paragraph RECORDS. Type and frequency of analyses for contaminated water to be taken to an off-site treatment, storage and disposal (TSD) facility shall conform to the requirements of the TSD facility. Type and frequency of analyses for

contaminated water to be discharged to the storm sewer system or other for contamination by petroleum products other than gasoline to be discharged to saltwater receiving waters, except as modified by the permitting agency. Sampling and analyses of contaminated water and treated water, and the Contractor and laboratory quality assurance programs, shall be in accordance with the approved Sampling and Analysis plan.

b. Treatment and Disposal

Water that cannot be discharged into the storm water drainage system or other permitted location without causing a violation of 9VAC 25-120 or 9VAC 25-260 or Section 01355 Environmental Protection, shall be treated as necessary for discharge compliance, or shall be transported for treatment and disposal by an approved off-site TSD facility. The selection of on-site treatment and discharge versus transporting and off-site disposal, shall be solely at the Contractor's risk and responsibility and the Government shall assume no responsibility for any lack of data or for any assumptions made by the Contractor. When the contaminated water is to be treated on site for discharge, the proposed treatment including methods for removing any free product if encountered shall be included in the Work Plan, and the resulting compliant water shall be discharged as specified below for discharge of uncontaminated water. For water to be taken to an off-site TSD facility, the Contractor shall transport, treat and dispose of the water in accordance with applicable requirements of 40 CFR 263, 40 CFR 264, 40 CFR 401, 9VAC 20-80, 9VAC 20-110, and 9VAC 25-260.

3.3.5 Discharge of Uncontaminated Water

Water that meets the requirements of 9VAC 25-260 and VPDES permit per 9VAC 25-31 and 9VAC 25-180 may be discharged into the storm water drainage system at the site. Discharge location and methods and sediment removal procedures shall minimize disturbance to the receiving media in accordance with applicable specifications and permits, and shall be approved prior to implementation. For any non-compliance, discharge shall be halted and measures shall be taken as necessary to comply with the applicable specification and permit requirements.

3.4 BACKFILLING

[Backfilling shall be in accordance with the applicable requirements of Section 02300 EARTHWORK.

3.5 CONTAMINATED SOIL DISPOSAL GUIDELINES

3.5.1 General

Disposal of soil contaminated with petroleum products shall be in accordance with 9VAC 20-80 and requirements specified herein. Soils with TPH concentrations in excess of 1,500 ppm, with BTEX concentrations in excess of 10 ppm, TOX concentrations in excess of 100 ppm, or soils containing regulated substances at concentrations above regulatory limit, shall be disposed of in hazardous waste landfills which are approved for disposal of such soils.

3.5.2 Transportation of Wastes

Transportation shall comply with the requirements of the Commonwealth of Virginia. Transportation of hazardous waste or special waste shall comply with 9VAC 20-60 and 9VAC 20-110.

3.5.3 Records

Records shall be maintained of all waste determinations, including appropriate results of analyses performed, substances and sample locations, the time of collection, and other pertinent data as required by CFR 40 Part 262 Subpart D. Transportation, treatment, disposal methods and dates, the quantities of waste, the names and addresses of each transporter and the treatment, storage, and disposal facility shall also be recorded and available for inspection, as well as copies or originals of the following documents:

- a. Manifests
 - b. Waste analyses or waste profile sheets
 - c. Certifications of final treatment/disposal signed by the responsible disposal facility official
 - d. Weighing scale receipt corresponding to each manifest
- Following contract close out, the records shall become the property of the Government.

3.5.4 Hazardous/Special Waste Manifests

For hazardous or special waste, the Contractor shall utilize a Commonwealth of Virginia approved manifest system in conformance with 9VAC 20-60 and CFR 40 Part 262 and CFR 40 Part 263 the U.S. EPA approved manifest system so that the waste can be tracked from generation to ultimate disposal. The Contractor shall prepare the manifests, complete. On the day of shipment, a manifest shall be supplied to the following for review: Contracting Officer or a designated representative will supply the generator number and sign the Generator's Certification if the manifest is accepted. If not acceptable, the Contractor shall make all corrections at no additional cost to the Government.

3.5.5 Documentation of Treatment or Disposal

a. Documentation

The waste shall be taken to a treatment, storage, or disposal facility which complies with [9VAC 20-60, 9VAC 20-80, or 9VAC 20-110. Provide documentation of acceptance of special waste or hazardous waste by the original return copy of the hazardous waste manifest, signed by the owner or operator of a facility legally permitted to treat or dispose of those materials. If the Contractor selects a different facility than is identified in the Work Plan, documentation shall be provided for approval to certify that the facility is authorized and meets the standards specified.

b. Payment

There will be no payment for excavation, transportation, and disposal of contaminated soils for which the transportation, disposal, and weight are not documented by the specified material manifest and corresponding

weighing scale receipt and other information specified in paragraph
RECORDS.

-- End of Section --

-- End of Section --

DRILLING LOG		DIVISION NIAD	INSTALLATION NAO	SHEET OF 1 SHEETS
1. PROJECT ADD. TO: AIRCRAFT OPERATIONAL PARKING APRON		10. SIZE AND TYPE OF BIT 2.0" OD SPLITSPRONG		
2. LOCATION (Coordinates or Station) LAFB		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL		
3. DRILLING AGENCY McCALLUM DRILLING		12. MANUFACTURER'S DESIGNATION OF DRILL CME 45B		
4. HOLE NO. (As shown on drawing title and file number) DH-1		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 6		UNDISTURBED
5. NAME OF DRILLER RONALD HAWK		14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER not/recorded		
7. THICKNESS OF OVERBURDEN		16. DATE HOLE MAY 26 81		COMPLETED MAY 26 81
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE +8.5		
9. TOTAL DEPTH OF HOLE 12.0'		18. TOTAL CORE RECOVERY FOR BORING %		
		19. SIGNATURE OF INSPECTOR Matthew T Byrne		

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
+8.5	0 ^b	c	d (CL) CLAY & w/ SAND, med plastic, tr roots, dry to moist, brn. tr-lit. gravel		1	0-2 7.9.9.8
+6.5	2		(CL) high plas. CLAY lit. vy. fn. SAND moist, orange soft		2	2-4 3.4.4.4
+4.5	4		(SC-CL) high plas. CLAY, SAND & SHELL mottle orange, moist OXID. YORKTOWN		3	4-6 5.5.5.6
+2.5	6		(SC-SM) fn. SAND, tr-lit high plas. CLAY, lit shell wet, gray "YORKTOWN"		4	6-8 7.9.8.10
	8				5	8-10 4.4.4.3
	10				6	10-12 3.5.7.9
-3.5	12		BOH @ 12.0' WATER @ COMPL. not recorded			

DIVISION NIAD		INSTALLATION NAO		SHEET OF 1 SHEETS	
1. PROJECT ADD. TO AIRCRAFT OPERATIONAL PARKING APRON			10. SIZE AND TYPE OF BIT 2" OD SPLIT SPOON		
2. LOCATION (Coordinates or Station) L.A.F.B.			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL		
3. DRILLING AGENCY McCALLUM DRILLING			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45B		
4. HOLE NO. (As shown on drawing title and file number) DH-2			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 6		UNDISTURBED
5. NAME OF DRILLER RONALD HAWK			14. TOTAL NUMBER CORE BOXES —		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER not recorded		16. DATE HOLE STARTED MAY 26 81 COMPLETED MAY 26 81
7. THICKNESS OF OVERBURDEN			17. ELEVATION TOP OF HOLE +9.2		
8. DEPTH DRILLED INTO ROCK			18. TOTAL CORE RECOVERY FOR BORING _____ %		
9. TOTAL DEPTH OF HOLE 12.0			19. SIGNATURE OF INSPECTOR Matthew T Byrne		

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVER- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
+9.2	0 ^b	c	(SM-ML) fn SAND, non plas., some Silt, tr. fibers, gray & brn, moist	e	f	g
+7.2	2		(CL) high plas CLAY lit. very fn. SAND orange & gray moist, tr. roots		1	0-2 4.8.7.5
+5.2	4		no rec. from 4.0'-6.0' extrapolating from other borings "OXIDIZED YORKTOWN"		2	2-4 2.7.4.6
	6		(SC-CL) fn. SAND & high plas. CLAY & shell fragments, orange wet "OXID. YORKTOWN"		3	4-6 NO recovery 4-6' 1.2.1.1
+1.2	8		(SM) fn. SAND, some Silt, some shell fragments, wet gray "YORKTOWN"		4	6-8 1.2.1.1
	10				5	8-10 3.5.5.6
					6	10-12 1.4.4.4
-2.8	12		BOH @ 12.0' water @ compl. not recorded			

DRILLING LOG		DIVISION NAD		INSTALLATION NAO		SHEET 1 OF 1 SHEETS	
1. PROJECT ADD TO AIRCRAFT OPERATIONAL PARKING APRON				10. SIZE AND TYPE OF BIT 6" Auger 2" OD split spn			
2. LOCATION (Coordinates or Station) LANGLEY AFB				11. DATUM FOR ELEVATION SHOWN (BBM or MSL) MSL			
3. DRILLING AGENCY McCALLUM				12. MANUFACTURER'S DESIGNATION OF DRILL CME 45B			
4. HOLE NO. (As shown on drawing title and file number) DH-13				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED 6	
5. NAME OF DRILLER Ronnie Hawk				14. TOTAL NUMBER CORE BOXES		UNDISTURBED 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER _____			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE STARTED 22 MAY 81 COMPLETED 22 MAY 81			
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE +9.5 MSL			
9. TOTAL DEPTH OF HOLE 12.0'				18. TOTAL CORE RECOVERY FOR BORING %			
				19. SIGNATURE OF INSPECTOR <i>Samuel H. Davis</i>			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
+9.5	0.0			
+9.0	0.5		TOP SOIL	
	2.0		(CL) CLAY and fn sand, some silt very moist to sat, brown, gray, and red	
	4.0			
	6.0			
+3.0	6.5		(SC) fn to cis SAND & SHELL FRAG and clay, wet, yellow- brown	
	8.0			
+0.5	9.0		(SM) fn to med SAND & SHELL FRAG some silt, wet, blue-gray	
	10.0		- YORKTOWN -	
-2.5	12.0			
			BOH - 12.0'	
			CAVE N- 1.0'(dry)	

DRILLING LOG		DIVISION NAD	INSTALLATION NAO	SHEET 1 OF 1 SHEETS
1. PROJECT ADD TO AIRCRAFT OPERATIONAL PARKING APRON			10. SIZE AND TYPE OF BIT 6" AUGER 2" OD Split Spn	
2. LOCATION (Coordinates or Station) LANGLEY A.F.B.			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY MSCALLUM			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45B	
4. HOLE NO. (As shown on drawing title and file number) DH-14			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 6	UNDISTURBED 0
5. NAME OF DRILLER Ronnie Hawk			14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER _____	
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 22 MAY 81 COMPLETED 22 MAY 81	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE +8.5 MSL	
9. TOTAL DEPTH OF HOLE 12.0 FT			18. TOTAL CORE RECOVERY FOR BORING %	
			19. SIGNATURE OF INSPECTOR <i>James J. Davis</i>	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	RECOVERED CORE PLAST	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
+8.5	b	c	d			DEPTH BLOWS
+8.0	0.5		TOPSOIL	NON		
	2.0		(SC) fn to med SAND and clay, moist, brown	high	1	0'-2' 3, 7, 6, 5
+5.0	3.5				2	2'-4' 2, 2, 3, 4
	4.0		(SC) fn to crs SAND & SHELL and clay, wet, yellow-brown	high	3	4'-6' 4, 7, 8, 7
+2.1	6.0				4	6'-8' 5, 9, 9, 10
	6.4				5	8'-10' 5, 3, 3, 3
	8.0		(SM) fn to med SAND & SHELL FRAG some silt, wet, blue-gray	med	6	10'-12' 3, 4, 5, 5
	10.0					
-3.5	12.0					

BOH- 12.0'
 WOR - 3.5'
 CAVE IN - 4.0' (WET)

DRILLING LOG		DIVISION NAD	INSTALLATION NAO	SHEET 1 OF 1 SHEETS
1. PROJECT ADD. TO AIRCRAFT OPERATIONAL PARKING APRON		10. SIZE AND TYPE OF BIT 6" Auger 2" OD Split Spn		
2. LOCATION (Coordinates or Station) LANGLEY A.F.B.		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL		
3. DRILLING AGENCY McCALLUM		12. MANUFACTURER'S DESIGNATION OF DRILL CME 45B		
4. HOLE NO. (As shown on drawing title and file number) DH-15		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 6		UNDISTURBED 0
5. NAME OF DRILLER Ronnie Hawk		14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER _____		
7. THICKNESS OF OVERBURDEN		16. DATE HOLE 22 MAY 81		COMPLETED 22 MAY 81
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 9.4 MSL		
9. TOTAL DEPTH OF HOLE 12.0'		18. TOTAL CORE RECOVERY FOR BORING _____ %		
19. SIGNATURE OF INSPECTOR Samuel H. Davis				

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY PLAST	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
+9.4	b	c	d			g
+8.9	0.5		TOPSOIL	NON		DEPT 1
	2.0		(SM) fn to med SAND some silt, little gravel, moist, grey and brown	med	1	0'-2' 3, 6, 6, 8
+5.4	4.0		(SC) fn to med SAND and clay, wet, brown	high	2	2'-4' 7, 9, 8, 7
+3.4	6.0		(SC) fn to crs SAND & SHELL FRAG and clay, wet, yellow-brown	high	3	4'-6' 4, 3, 2, 1
+1.6	7.8		(SC) fn to crs SAND & SHELL FRAG and clay, wet, yellow-brown	high	4	6'-8' 1, 1, 1, 1
	10.0		(SM) fn to med SAND & SHELL FRAG some silt, wet, blue-grey		5	8'-10' 6, 5, 8, 7
			YORKTOWN -		6	10'-12' 3, 2, 4, 5
-2.6	12.0					
			BOH - 12.0'			
			CAVE IN - 1.0' (DRY)			

DRILLING LOG		DIVISION NAD	INSTALLATION NAO	SHEET 1 OF 1 SHEETS
1. PROJECT ADDITION TO AIRCRAFT OPERATIONAL PARKING APRON			10. SIZE AND TYPE OF BIT 2" O.D. SPLIT SPOON	
2. LOCATION (Coordinates or Station) LANGLEY A.F.B.			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY MC CALLUM			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45B	
4. HOLE NO. (As shown on drawing title and file number) 101 DH-26			13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN	DISTURBED 6 UNDISTURBED
5. NAME OF DRILLER RONALD HAWK			14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER +2.0	
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 21 MAY 81 COMPLETED 21 MAY 81	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE +9.0	
9. TOTAL DEPTH OF HOLE 12'			18. TOTAL CORE RECOVERY FOR BORING %	
			19. SIGNATURE OF INSPECTOR Joseph L. Miller	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
+9.0	(ft) b	c	d	e	f	(ft) g "Blows / 6"
	0		(SC) SAND, fn, lit med plas clay, tr gravel, br, moist		1	0-2 3.5.7.6
+7.0	2		(CL) CLAY, hi plas, lit fn sand, br-gry, moist		2	2-4 3.4.7.6
+5.0	4		(SC) SAND, fn, some hi plas clay, orange, vy moist		3	4-6 3.4.3.4
+2.0	8		tr hi plas clay, and SHELL FRAG		4	6-8 2.4.2.4
+0.5	8.5		OXIDIZED YORKTOWN			
			(SM) SAND, med, lit med plas silt, tr shell frag, blue-gry, moist		5	8-10 3.2.2.3
			YORKTOWN		6	10-12 WOH. 2.4.5
-3.0	12					
			BOH = 12'			
			WOK = 7'			

DRILLING LOG		DIVISION NAD	INSTALLATION NAD	SHEET 1 OF 1 SHEETS
1. PROJECT ADDITION TO AIRCRAFT OPERATIONAL PARKING APRON			10. SIZE AND TYPE OF BIT 2" O.D. SPLIT & POON	
2. LOCATION (Coordinates or Station) LANGLEY A.F.B.			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY M ^c CALLUM			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45B	
4. HOLE NO. (As shown on drawing title and file number) 101 DH-27			13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN	DISTURBED 6 UNDISTURBED
5. NAME OF DRILLER RONALD HAWK			14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER +1.0	
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 21 MAY 81 COMPLETED 21 MAY 81	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE +8.0	
9. TOTAL DEPTH OF HOLE 12'			18. TOTAL CORE RECOVERY FOR BORING %	
			19. SIGNATURE OF INSPECTOR Joseph J. Miller	

ELEVATION	DEPTH (ft) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
+8.0	0		(SC) SAND, fn, lit hi plas clay, tr roots, br, moist		1	0-2 2.4.3.4
			(CH) CLAY, hi plas, some fn sand, br, moist		2	2-4 4.6.5.5
+4.5	3.5		(SC) SAND, fn, some med plag clay, tr root fibers, br, moist			
+4.0	4		(SC) SAND, fn-med, lit hi plas clay, and SHELL FRAG, orange, moist		3	4-6 3.3.4.4
+2.0	6		OXIDIZED YORKTOWN			
+1.0	7		(SM) SAND, fn-med, lit med plas silt, and SHELL FRAG, blue-gry, v. moist		4	6-8 5.7.4.5
			YORKTOWN	8" SAND	5	8-10 5.7.7.8
			lit shell frag, moist		6	10-12 4.7.8.9
-4.0	12		BOH = 12' WOC = 7'			

DRILLING LOG		DIVISION NAD	INSTALLATION NAO		SHEET 1 OF 1 SHEETS
1. PROJECT ADDITION TO AIRCRAFT OPERATION PARKING APRON			10. SIZE AND TYPE OF BIT 2" O.D. SPLITSPOON		
2. LOCATION (Coordinates or Station) LANGLEY AFB			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL		
3. DRILLING AGENCY MCCALLUM			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45B		
4. HOLE NO. (As shown on drawing title and file number) 101 DH-28			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 6		13. DISTURBED 6
5. NAME OF DRILLER RONALD HAWK			14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER +0.9		
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 21 MAY 81 COMPLETED 21 MAY 81		
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE +7.9		
9. TOTAL DEPTH OF HOLE 12'			18. TOTAL CORE RECOVERY FOR BORING %		
			19. SIGNATURE OF INSPECTOR Joseph L. Miller		

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
+7.9	(+1)b	c	d	e	f	(+1)g Blows/6"
	0		(SM) SAND, fn, some med plas, tr root fiber, br, moist		1	0-2 3-3.4.4
+5.9	2		(SC-CL) SAND, fn, some hi plas silt & clay, br, moist		2	2-4 4.5.5.3
+3.9	4		(SC) SAND, vy fn, and hi plas CLAY, vy soft, br, wet	6" SAM	3	4-6 1.1.1.1
+0.9	7.5		med SAND, lit hi plas clay, and SHELL FRAG, orange, wet OXIDIZED YORKTOWN		4	6-8 1.2.4.3
+0.4			(SM) SAND, med, tr med plas silt, tr shell frag, blue-grey, moist		5	8-10 5.4.5.6
			YORKTOWN		6	10-12 1.5.6.8
-4.1	12		BOH = 12' WdC = 7' <u>2</u> CAYE IN = 4'			

DRILLING LOG		DIVISION NAD	INSTALLATION NAO	SHEET 1 OF 1 SHEETS
1. PROJECT CONTROL TOWER			10. SIZE AND TYPE OF BIT 2" O.D. SPLITSPOON	
2. LOCATION (Coordinates or Station) LANGLEY AFB VIRGINIA			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY ATEC ASSOCIATES			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45	
4. HOLE NO. (As shown on drawing title and file number) 105 DH-1			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 5 UNDISTURBED
5. NAME OF DRILLER CARL BENSEN			14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER + 1.0'	
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 8 DEC 81 COMPLETED 8 DEC 81	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE 9.5'	
9. TOTAL DEPTH OF HOLE 10'			18. TOTAL CORE RECOVERY FOR BORING %	
			19. SIGNATURE OF INSPECTOR Joseph L. Mill	

ELEVATION (ft) a	DEPTH (ft) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	+ #200	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (ft) g	Blows/6" h
8.7	0.8		10" CONCRETE PAVEMENT	**			
			(SC) SAND, fn, and high plas CLAY, tr. pea gravel, br, moist	57%	1	0-2	3.3 pH = 7.3
			* LL = 46 PL = 18 PI = 28 + #200 = 62% fn	48%	2	2-4	4.6.6.7 pH = 7.4
3.5	6			52%	3	4-6	3.5.5.5 pH = 7.4
			(SC) SAND, fn, some high plas clay, some shell frag, br, moist		4	6-8	1.2.3.5
1.0 2	8.5		* LL = 52 PL = 22 PI = 30 + #200 = 79% fn-c		5	8-10	5.8.7.11
-0.5	10						

BOH = 10'
WO/C = 8.5'
CAVE IN = 9'

* LIMITS & GRADATIONS
WERE RUN ON COMPOSITE
SAMPLES FROM ALL 5
BORINGS AT THE RESPECTIVE
DEPTHS.

** GRADATIONS ON
20g pH samples

DRILLING LOG		DIVISION NAD	INSTALLATION NAO	SHEET 1 OF 1 SHEETS
1. PROJECT CONTROL TOWER			10. SIZE AND TYPE OF BIT 2" O.D. SPLIT SPOON	
2. LOCATION (Coordinates or Station) LANGLEY AFB. VIRGINIA			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY ATEC ASSOCIATES			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45	
4. HOLE NO. (As shown on drawing title and file number) 105 DH-2			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 5	UNDISTURBED
5. NAME OF DRILLER CARL BENSEN			14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 0.5'	
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 8 DEC 81 COMPLETED 8 DEC 81	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE 9.5'	
9. TOTAL DEPTH OF HOLE 10'			18. TOTAL CORE RECOVERY FOR BORING %	
			19. SIGNATURE OF INSPECTOR <i>Joseph J. Miller</i>	

ELEVATION (ft) a	DEPTH (ft) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	+ #200	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (ft) g	BLOWS/6"
8.7	0.8		10" CONCRETE PAVEMENT	**			
7.5	2		(SC-CL) SAND, fn, and high plas CLAY, br, moist	48%	1	0-2	2.4 pH = 7.5
5.5	4		(SC-SM) SAND, fn, and med plas SILTS & CLAYS, tr gravel, gry, moist	47%	2	2-4	10.13.16.11 pH = 7.0
3.5	6		(SC-CL) SAND, fn, and high plas CLAY, br, moist	49%	3	4-6	4.3.4.4 pH = 7.7
0.5	9		(SC) SAND, fn-c, and SHELL FRAG, some high plas clay, br, moist		4	6-8	3.3.5.7
-0.5	10		w/d grades to (SM)		5	8-10	3.7.7.12

BOH = 10'
WOR = 9'

** GRADATIONS ON
20g pH SAMPLES

DRILLING LOG		DIVISION NAD	INSTALLATION NAO	SHEET 1 OF 2 SHEETS
1. PROJECT CONTROL TOWER		10. SIZE AND TYPE OF BIT 2" O.D. SPLITS POON		
2. LOCATION (Coordinates or Station) LANGLEY AFB VIRGINIA		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL		
3. DRILLING AGENCY ATEC ASSOCIATES		12. MANUFACTURER'S DESIGNATION OF DRILL CME 45		
4. HOLE NO. (As shown on drawing title and file number) 105 DH-3		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 22	UNDISTURBED
5. NAME OF DRILLER CARL BENSEN		14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 1.0'		
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 7 DEC 81 COMPLETED 7 DEC 81		
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 9.5'		
9. TOTAL DEPTH OF HOLE 95'		18. TOTAL CORE RECOVERY FOR BORING %		
		19. SIGNATURE OF INSPECTOR [Signature]		

ELEVATION (ft) a	DEPTH (ft) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	+ # 200	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (ft) g	Blows / 6"
9.5	0		(SC-CL) SAND, fn, and highplas CLAY, 1.1 gravel, br, moist LL=40 PL=17 PI=23 + #200 = 47% fn	** 51%	1	0-2	15.9.9.13 pH=7.9
3.5	6			40%	2	2-4	8.9.11.12 pH=7.7
1.0	8.5		(SC) SAND, fn, and SHELL FRAG, some highplas clay, br, moist	61%	3	4-6	2.4.4.5 pH=7.2
-0.5	10		(SM) SAND, fn, and SHELL FRAG, 1.1 non plas silt, blue-gry, moist		4	6-8	1.4.6.8
					5	8-10	3.2.4.4
					6	13.5-15	3.4.5
					7	18.5-20	3.5.7
					8	23.5-25	3.5.8
					9	28.5-30	4.7.10
					10	33.5-35	5.9.9
					11	38.5-40	4.6.11

** GRADATIONS ON
20 g pH SAMPLES

- 41.5

50

ENG FORM 1836
MAR 71

PREVIOUS EDITIONS ARE OBSOLETE.

(TRANSLUCENT)

PROJECT

CONTROL TOWER
L.A.F.B., VA

HOLE NO.

105 DH-3

12

43.5-45

4.5.6

13

48.5-50

4.6.8

DRILLING LOG		DIVISION NAD	INSTALLATION NAD	SHEET 2 OF 2 SHEETS	
1. PROJECT CONTROL TOWER			10. SIZE AND TYPE OF BIT 2" O.D. SPLITSPOON		
2. LOCATION (Coordinates or Station) LANGLEY AFB VIRGINIA			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL		
3. DRILLING AGENCY ATEC ASSOCIATES			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45		
4. HOLE NO. (As shown on drawing title and file number) 105 DH-3			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED 22
5. NAME OF DRILLER CARL BENSEN			14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 1.0'		UNDISTURBED
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 7 DEC 81 COMPLETED 7 DEC 81		
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE 9.5'		
9. TOTAL DEPTH OF HOLE 95'			18. TOTAL CORE RECOVERY FOR BORING %		
			19. SIGNATURE OF INSPECTOR Jaye + Mall		

ELEVATION (ft) a	DEPTH (ft) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g BLOW / 6"
-41.5	50					
					14	53.5-55 5.7.11
					15	58.5-60 4.4.5
-54	63.5		(SM-SC) SAND, fn, some low plas silts and clays, tr c shell frag, blue-gry, moist		16	63.5-65 3.4.5
					17	68.5-70 4.5.5
					18	73.5-75 5.6.6
-69.5	79				19	78.5-80 7.10.10
			(CH) CLAY, hi plas, tr fn sand, blue-gry, sat LL = 60 PL = 20 PI = 40 + #200 = 17% fn		20	83.5-85 5.9.9
-78	82.5					

-80.5	90	(bc) SAND, fn, and c shell frag, blue-gry, sat	21	87.5-90	10-22-28
		(SM) SAND, fn, lit non plas silt, tr shell frag, blue-gry, sat			
-85.5	95	+ #200 = 88%	22	93.5-95	11-17-18
		BOH = 95' WOR = 8.5'			

ENG FORM 1836
MAR 71

PREVIOUS EDITIONS ARE OBSOLETE.

(TRANSLUCENT)

PROJECT CONTROL TOWER
L.A.F.B., VA.

HOLE NO.

105 DH-3

DRILLING LOG		DIVISION NAO	INSTALLATION NAO	SHEET 1 OF 1 SHEETS	
1. PROJECT CONTROL TOWER			10. SIZE AND TYPE OF BIT 2" O.D. SPLITSPOON		
2. LOCATION (Coordinates or Station) LANGLEY AFB VIRGINIA			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL		
3. DRILLING AGENCY ATEC ASSOCIATES			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45		
4. HOLE NO. (As shown on drawing title and file number) 105 DH-4			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 5	UNDISTURBED
5. NAME OF DRILLER CARL BENSEN			14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 0.5'		
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED 8 DEC 81 COMPLETED 8 DEC 81		
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE 9.5'		
9. TOTAL DEPTH OF HOLE 10'			18. TOTAL CORE RECOVERY FOR BORING %		
			19. SIGNATURE OF INSPECTOR Joseph L. Miller		

ELEVATION (ft) a	DEPTH (ft) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	+ H2O0	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (ft) g	BLOWS / 6"
9.5	0		10" CONCRETE PAVEMENT	**			
8.7	0.8		(SC) SAND, fn, and high plas CLAY, tr pea gravel, br, moist	59%	1	0-2	2.1 pH = 7.5
				64%	2	2-4	3.4.4.3 pH = 6.8
				59%	3	4-6	2.3.4.4 pH = 7.5
3.5	6		(SC) SAND, fn, and SHELL FRAG, some high plas clay, br, moist		4	6-8	4.3.5.7
0.5	9				5	8-10	6.9.9.12
-0.5	10		(SM)				
			BOH = 10 WOLC = 9' CAVE IN = 9.2'				
			** GRADATIONS ON 20 g pH SAMPLES				

DRILLING LOG		DIVISION NAO	INSTALLATION NAO	SHEET 1 OF 1 SHEETS
1. PROJECT CONTROL TOWER		10. SIZE AND TYPE OF BIT 2" O.D. SPLITSPOON		
2. LOCATION (Coordinates or Station) LANGLEY AFB VIRGINIA		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL		
3. DRILLING AGENCY ATEC ASSOCIATES		12. MANUFACTURER'S DESIGNATION OF DRILL CME 45		
4. HOLE NO. (As shown on drawing title and file number) 105 DH-5		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		UNDISTURBED
5. NAME OF DRILLER CARL BENSEN		14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		16. DATE HOLE 8 DEC 81		STARTED 8 DEC 81
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 9.5'		
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %		
9. TOTAL DEPTH OF HOLE 10'		19. SIGNATURE OF INSPECTOR Jorge + mill		

ELEVATION (+)	DEPTH (+)	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	+ # 200 f	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (+)	g
9.5	0		10" CONCRETE PAVEMENT	**			
8.7	0.8		(SC-CL) SAND, fn, and high plas CLAY, tr pea gravel, br, moist	51%	1	0-2	1.1
				50%	2	2-4	1. WOH
				49%	3	4-6	1.2.1.2
3.5	6		(SC) SAND, fn, and SHELL FRAG, some high plas clay, br, moist		4	6-8	2.1.3.5
					5	8-10	5.7.5.8
-0.5	10						
			BOH = 10' no water reading taken				
			** GRADATIONS ON 20 g pH SAMPLES				

SECTION 02220A

DEMOLITION
05/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1

(1996) U.S. Army Corps of Engineers Safety
and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

The work includes demolition of existing West Parking Apron and identified portions of stormwater collection system and abandoned P.O.L. contaminated groundwater collection, holding and treatment system, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan; G

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

1.4 DUST CONTROL

Contractor to comply with all LAFB requirements on dust reduction and allyins during demolition activities. The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

1.5 PROTECTION

1.5.1 Protection of Personnel

The work shall be coordinated with applicable requirements in section 02072. During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.5.2 Protection of Structures

New stormdrain inlet and modified existing structure walls, and other structural componenets that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, or lateral support until demolished to extent shown on details, unless directed structure components determined to be unstable are left unsupported and shall be responsible for placing and securing temporary bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.3 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, modified and to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. If the contractor breaks existing fuel lines shall cap the line immediately.

1.5.4 Environmental Protection

The work shall comply with the requirements of Section 01355 ENVIRONMENTAL PROTECTION.

1.6 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.7 USE OF EXPLOSIVES

Use of explosives will not be permitted.

1.8 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be available to the Contractor.

1.9 FOREIGN OBJECT DAMAGE (FOD)

Aircraft and aircraft engines are subject to FOD from debris and waste material lying on airfield pavements. Immediately remove all such materials that may appear on operational aircraft pavements due to the Contractor's operations.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

Works under this section shall be coordinated with applicable requirements of Section 02072 excavation of petroleum contaminated soil.

3.1 EXISTING STRUCTURES

Existing structures, concrete pavement with and without bituminous overlay, box drain, storm/manhole covers, decommissioned POL contaminated water collection/holding and treatment system elements and appurtenances shall be removed to dimensions/details shown or to clear new construction and pavement sections.

3.2 UTILITIES

Existing inactive utilities shall be removed as indicated. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area.

3.3 DISPOSITION OF MATERIAL

Title to material and equipment to be demolished, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

3.3.1 Salvagable Items

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

3.3.2 Unsalvageable Material

Concrete, bituminous paving material, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of in the off-base disposal area procured by the Contractor. Combustible material shall be disposed of off the site.

3.4 CLEAN UP

Demolition debris and rubbish shall be removed from the Government Property.

Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local and state regulations regarding hauling and disposal shall apply.

3.5 PAVEMENTS, BASE MATERIAL AND SUBGRADE

Existing pavements designated for removal shall be saw cut or demolished in a manner approved by C.O.R. and removed in accordance with the details shown on the drawings and to the limits and depths indicated on the drawings. Any existing in place base material shall be removed as well as undercut subgrade material, as necessary to construct the new Pavement Section.

3.6 CONCRETE RECYCLING

Concrete pavement to be removed shall be recycled. It may be turned over to the commercial concrete recycler and delivered to the recycle yard. The weight of concrete taken off base for recycling shall be reported to CO. The weight of all concrete that is disposed of as solid waste shall be reported to CO as demolition debris.

-- End of Section --

SECTION 02300A

EARTHWORK
12/97

PART 1 GENERAL

1.1 APPLICABILITY

This specification covers primarily work required to underout existing subgrade beneath existing paved West Parking Apron for aircraft to allow the construction of the new 18.5 inch concrete pavement paced upon a graded aggregate base course.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 180	(1997) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457 mm (18-in) Drop
AASHTO T 224	(1996) Correction for Coarse Particles in the Soil Compaction Test

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1140	(1997) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990; R 1996el) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.3 DEFINITIONS

1.3.1 Satisfactory Materials

Satisfactory fill and backfill materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, comprised of stones less than 3 inches in any dimension. The preceding listed materials plus CL, ML, CH, and MH are satisfactory in-situ.

1.3.2 Unsatisfactory Materials

Materials classified by ASTM D 2487 as OL, OH, and PT are unsatisfactory in-situ and as any kind of fill for backfill, and all materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. The Contracting Officer shall be notified of any contaminated materials.

1.3.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

1.3.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the appropriate test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Selection of Borrow Material; FIO.

Utilization of Excavated Material; FIO

Procedure and location for disposal of unused satisfactory material.

SD-06 Test Reports

Testing; G.

Within 24 hours of conclusion of physical tests, 6 copies of test results, including calibration curves and results of calibration tests.

SD-07 Certificates

Testing; G.

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

1.5 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of in designated waste disposal or spoil areas off government controlled property. Satisfactory non-contaminated material removed from excavations shall be used, insofar as practicable, in the construction of subgrades, bedding (as backfill), and for similar purposes, prior to wasting it. Satisfactory material authorized to be wasted shall be disposed of off of Government property.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 EXCAVATION

The Contractor shall perform excavation undercut of existing subgrade of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be used to replace any unsatisfactory material that may be encountered. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required shall be disposed of off base. Unsatisfactory excavated material shall be disposed of off base. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill in excess of that produced by excavation within the grading limits shall be obtained from commercial source.

3.1.1 Drainage Structures

Excavations shall be made to details and elevations shown, or as directed. Foundation pits shall be of sufficient size to permit the placement and

removal of forms for the full length and width of structure footings and foundations as shown. When concrete is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete is to be placed.

3.2 GRADING AREAS

Work will be divided into grading areas within which satisfactory excavated material shall be placed in areas in which unsatisfactory material was encountered. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

3.3 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 95 percent laboratory maximum density except in the final 12 inches beneath pavement where this requirement will be increased to 98 percent laboratory maximum density. Fill material shall be placed in lifts not to exceed 8 inches and shall be compacted within 2% of optimum moisture content. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.4 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

3.5 SUBGRADE PREPARATION

3.5.1 Construction

Subgrade shall be shaped to line and grade, required to support new base and pavement section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Low areas resulting from removal of unsatisfactory material shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as with appropriately sized compaction equipment specified. After rolling, the surface of the subgrade for airfields shall not show deviations greater than 0.5 inch when tested with a 10 foot straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade based upon the parking apron finished grade.

3.5.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the material being compacted. Subgrade compacted to at least 95 percent of laboratory maximum density for a thickness of six inches. Compaction equipment furnished and used by the contractor shall be of appropriate size and dimensions for work effort required. Oversized compaction equipment shall not be brought on the site or used on this project.

3.6 FINISHING

The surface of excavations, fills, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

3.7 SUBGRADE PROTECTION

During construction excavations shall be kept shaped and drained. Contractor may utilize existing concrete storm drain pipes located within construction limits by installing and providing temporary storm water outfall ports/penetrations thru existing pipe wall. Temporary connections shall not allow contaminated water to enter storm drains, and shall be restored after removal. Ditches and drains along subgrade shall not be disturbed by traffic or other operations and shall be protected and maintained by the Contractor in a satisfactory condition until the placement of geotextile fabric (separation layer) and the placement of the base course layer of the pavement section. The storage or stockpiling of materials on the finished subgrade has been checked and approved, and in no case shall be base course, surfacing, or pavement be placed on a muddy, spongy, or frozen subgrade..

3.8 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. At least one test by method D1556 shall be performed for every eight tests, by method D2922, and results by method D2922 shall be adjusted according to the results by method D1556 which shall govern for contract compliance. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.8.1 Fill and Backfill Material Gradation

One test per 100 cubic yards stockpiled or in-place source material.

Gradation of fill and backfill material shall be determined in accordance with ASTM C 136.

3.8.2 In-Place Densities

One test per 100 square yards, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

3.8.3 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

3.8.4 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 100 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.8.5 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

-- End of Section --

SECTION 02390A

MOORING/GROUNDING POINTS FOR AIRCRAFT
07/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 436	(1984; R 1997el) Austenitic Gray Iron Castings
ASTM A 615/A 615M	(1996ael) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 616/A 616M	(1996a) Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 617/A 617M	(1996a) Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM B 8	(1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B 371	(1996) Copper-Zinc-Silicon Alloy Rod
ASTM C 94/C 94M	(2000) Ready-Mixed Concrete

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1998) Structural Welding Code - Reinforcing steel
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CORPS OF ENGINEERS (COE)

COE CRD-C 300	(1990) Specifications for Membrane-Forming Compounds for Curing Concrete
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 407	(1996) Aircraft Fuel Servicing
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UNDERWRITERS LABORATORIES (UL)

UL 467	(1993; Rev thru Apr 1999) Grounding and Bonding Equipment
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

As-Built Drawings; G

Drawings that provide current factual information, including deviations from and amendments to the drawings and changes in the work, concealed and visible.

SD-06 Test Reports

Tests; G

An independent testing agency's certified reports of inspections and tests, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and test standards shall be described.

SD-07 Certificates

Mooring/Grounding Rods; G

Certificate of compliance stating that the grounding rods meet the specified requirements.

PART 2 PRODUCTS

2.1 METALS

Combination of materials that forms an electrolytic couple, which accelerates corrosion in the presence of moisture, shall not be used, unless moisture is permanently excluded from the junction of such metals.

2.2 MOORING/GROUNDING RODS

Mooring/Grounding rods shall conform to UL 467 and shall be made of copper-clad steel. The rods shall be not less than 3/4 inch in diameter and not less than 10 feet long. The copper cladding shall conform to the applicable requirements of ASTM B 371, Copper Alloy UNS No's. c 69400, c 69430, c 69440 or c 69450. The copper cladding shall be not less than 0.010 inches thick at any point and shall comply with adherence requirements and the banding requirements of UL 467. The Contractor shall submit certificates of compliance on the mooring/grounding rods. Rods shall be provided with a closed eye or shepherd's hook bend having an inside diameter of not less than 1-1/2 inches. The rods shall be pointed.

2.3 GROUNDING CONNECTORS

Grounding connectors shall comply with UL 467 for the required application. The Contractor shall submit certificates of compliance on the grounding connectors.

2.4 CONCRETE

Concrete shall be in accordance with Section 02753 CONCRETE PAVEMENT FOR AIRFIELDS.

PART 3 EXECUTION

3.1 MOORING/GROUNDING POINTS

The mooring/grounding points shall be located as shown on the contract drawings to within plus or minus 2 inches.

3.1.1 Pavement Recess

The top of the mooring/grounding rod shall be set at or not more than 1/4 inch below the pavement surface grade. A recess 2-3/4 inches wide, and not more than 6 inches long, with a smooth rounded edge shall be provided in the pavement around the grounding point anchor eye to permit the entrance of lines into the eye and to allow for attachment of the grounding cable. The depth of the recess shall be no deeper than the bottom of the opening of the grounding point eye.

3.1.2 Installation

3.1.2.1 New Rigid Pavement

The mooring/grounding rod shall be installed by pushing or driving the rod through the pavement base course and subgrade prior to concrete placement. The installation technique chosen by the Contractor shall not damage the mooring/grounding rod. Hand finishing around the rod shall be kept to a minimum.

3.2 TESTS

Resistance to ground tests shall be measured as specified in NFPA 407. Test results shall be submitted to the Contracting Officer. Any mooring/ground rods that have more than 10,000 ohms of resistance shall be reported to the contracting officer immediately.

-- End of Section --

SECTION 02630A

DRAINAGE SYSTEM

03/00

PART 1 GENERAL

1.1 WORK SCOPE

Work Scope covered by this section is for the retrofitting of aircraft service type frames and grates on existing in place cast reinforced concrete junction boxes (manholes) and new cast in place reinforced concrete junction boxes (manholes) complete with frames and grates. The new structures must be constructed around existing in-service reinforced concrete pipe(s). This section also covers the installation of the granular base material subdrain system consisting of slotted and solid PVC subdrain pipe to be installed in granular, geofabric draped collection trench and tied into (with solid PVC pipe) to new and existing structures (junction boxes/manholes).

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 346/346R	(1990) Standard Specification for Cast-in-Place Nonreinforced Concrete Pipe and Recommendations
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AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO HB-16	(1996) Standard Specifications for Highway Bridges
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AASHTO M 198	(1998) Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
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AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION
(AREMA)

AREMA Manual	(1999) Manual for Railway Engineering (4 Vol.)
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 48	(1994a) Gray Iron Castings
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ASTM A 48M	(1994 el) Gray Iron Castings (Metric)
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ASTM A 123/A 123M	(1997ael) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
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ASTM A 536	(1999e1) Ductile Iron Castings
ASTM A 716	(1995) Ductile Iron Culvert Pipe
ASTM C 32	(1999e1) Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C 55	(1999) Concrete Brick
ASTM C 76	(1999) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 231	(1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 270	(1997) Mortar for Unit Masonry
ASTM C 443	(1998) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 478	(1997) Precast Reinforced Concrete Manhole Sections
ASTM C 655	(1995a) Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C 923	(1998) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Materials
ASTM C 924	(1998) Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C 1103	(1994) Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM D 1056	(1998) Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 1171	(1994) Rubber Deterioration - Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996e1) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC)

	Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2321	(1989; R 1995) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2922	(1996e1) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3034	(1998) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	(1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F 477	(1999) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 758	Smooth wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain systems for Airport
ASTM F 794	(1999) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 949	(1999) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F 1417	(1992; R 1998) Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Placing Pipe; G

Printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

SD-04 Samples

Pipe for Drainage System; G

Perforated Pipe

Solid Pipe
Connectors

SD-07 Certificates

Resin Certification; G
Pipe; G
Hydrostatic Test on Watertight Joints;
Determination of Density; G
Frame and Cover for Gratings; G

Airfield Service Type Certified copies of test reports demonstrating conformance to applicable pipe specifications, before pipe is installed. Certification on the ability of frame and cover or gratings to carry the imposed live load.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.4.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

2.1.1 Concrete Pipe

ASTM C 76, Class IV or V.

2.1.2 PVC Pipe (For Subdrain System)

The pipe manufacturer's resin certification, indicating the cell classification of PVC used to manufacture the pipe, shall be submitted prior to installation of the pipe.

2.1.2.1 PVC Pipe (Smooth Wall and Longitudinally perforated)

ASTM F 758 produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, minimum cell class 12454-B. Wall thickness of PVC Pipe shall be (minimum) 0.153 inches.

2.2 DRAINAGE STRUCTURES

2.3 MISCELLANEOUS MATERIALS

2.3.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for concrete under Section 2753A CONCRETE PAVEMENT FOR AIRFIELDS. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C 231.

The concrete covering over steel reinforcing shall not be less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 3 inches between steel and ground. Expansion-joint filler material shall conform to ASTM D 1751, or ASTM D 1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D 1752.

2.3.2 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C 270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

2.3.3 Frame and Cover for Gratings

Frame and cover for gratings located in the aircraft parking apron shall be cast ductile iron, ASTM A 536, Grade 65-45-12; suitable for continuous service (wheel loading 58,000 lbs per tire) by aircraft, with tire pressures of 325 pounds per square inch. Shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans. Contractor to provide certification that grates and frames will withstand anticipated traffic and wheel loading.

2.3.4 Joints

2.3.4.1 Flexible Watertight Joints

- a. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe and with factory-fabricated resilient materials for clay pipe. The design of joints and the physical requirements for plastic gaskets shall conform to AASHTO M 198, and rubber-type gaskets shall conform to ASTM C 443. Factory-fabricated resilient joint materials shall conform to ASTM C 425. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated

splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.

- b. Test Requirements: Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C 443. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

2.3.4.2 PVC Plastic Pipes

Joints shall be solvent cement or elastomeric gasket type in accordance with the specification for the pipe and as recommended by the pipe manufacturer.

2.4 RESILIENT CONNECTORS

Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C 923.

2.5 HYDROSTATIC TEST ON WATERTIGHT JOINTS

2.5.1 Concrete and PVC Pipe

A hydrostatic test shall be made on the watertight joint types as proposed.

Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme temperatures which might adversely affect the performance of such materials. Performance requirements for joints in reinforced and nonreinforced concrete pipe shall conform to AASHTO M 198 or ASTM C 443. Test requirements for joints in clay pipe shall conform to ASTM C 425. Test requirements for joints in PVC and PE plastic pipe shall conform to ASTM D 3212.

PART 3 EXECUTION

3.1 EXCAVATION FOR STORM DRAINS, SUBDRAINS, AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for drainage system, shall be in accordance with the applicable portions of Section 02316

"Excavation, Trenching, and Backfilling for Utilities Systems" and the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 24 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheet piling and bracing, where required, shall be placed within the trench width as specified. Contractor shall not overexcavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary.

Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

3.1.2 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe or new drainage structure as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the government.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Concrete Pipe Requirements

When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe for the entire length of the pipe. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

3.2.2 Plastic Pipe (for subdrain system)

Bedding for PVC pipe shall meet the requirements of ASTM D 2321. Bedding, haunching, and initial backfill shall be either Class IB or II material. Slotted or perforated PVC pipe shall be bedded within a granular material envelope as shown or within a granular material envelope as shown on drawings. The envelope shall be shrouded with good quality geo-fabric.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. Deflection of installed flexible pipe shall not exceed the following limits:

TYPE OF PIPE	MAXIMUM ALLOWABLE DEFLECTION (%)
Plastic	7.5

Not less than 30 days after the completion of backfilling, the Government may perform a deflection test on the entire length of installed flexible pipe using a mandrel or other suitable device. Installed flexible pipe showing deflections greater than those indicated above shall be retested by

a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

3.3.1 Concrete and PVC Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

3.4 JOINTING

3.4.1 Concrete and Clay Pipe

3.4.1.1 Cement-Mortar Tongue-and-Groove Joint

The first pipe shall be bedded carefully to the established gradeline with the groove upstream. A shallow excavation shall be made underneath the pipe at the joint and filled with mortar to provide a bed for the pipe. The grooved end of the first pipe shall be thoroughly cleaned with a wet brush, and a layer of soft mortar applied to the lower half of the groove. The tongue of the second pipe shall be cleaned with a wet brush; while in horizontal position, a layer of soft mortar shall be applied to the upper half of the tongue. The tongue end of the second pipe shall be inserted in the grooved end of the first pipe until mortar is squeezed out on interior and exterior surfaces. Sufficient mortar shall be used to fill the joint completely and to form a bead on the outside.

3.4.1.2 Flexible Watertight Joints

Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

3.5 DRAINAGE STRUCTURES

3.5.1 Manholes (Junction Boxes)

Construction shall be of cast-in-place reinforced concrete, complete with Airfield service type frames and covers or gratings. Pipe connections to concrete manholes and inlets shall be made with flexible, watertight connectors. New drop inlets (manholes) must be constructed around existing concrete pipe. Upon completion of construction the pipe within the inlet (manhole) shall be removed carefully. The bottom third of pipe(s) may be left in place as invert. Contractor may submit an alternate design for new drop inlets and retrofitted existing drainage structures for review and approval. Alternate design shall meet design loading indicated and shall be suitable for service required.

3.6 BACKFILLING

3.6.1 Backfilling around Pipe in Trenches and Excavation Pits

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 8 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.6.2 Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 8 inches.

3.6.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.6.4 Compaction

3.6.4.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.6.4.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

- a. Under airfield aircraft, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.

3.6.5 Determination of Density

Testing shall be the responsibility of the Contractor and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D 1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017 or ASTM D 2922. Test results shall be furnished the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

-- End of Section --

SECTION 02722

AGGREGATE BASE COURSE
05/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 96	(1996) Resistance to Degradation of Small-size coarse Aggregate by Abrasion and Impact in the Los Angeles machine.
AASHTO T 180	(1997) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457 mm (18-in) Drop
AASHTO T 103	Soundness of Aggregates by Freezing and Thawing
AASHTO T 104	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
AASHTO T 224	(1996) Correction for Coarse Particles in the Soil Compaction Test

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29/C 29M	(1997) Bulk Density ("Unit Weight") and Voids in Aggregates
ASTM C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(1988; R 1993e1) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1997) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 698	Laboratory Compaction Characteristics of Soil using Standard Effort
ASTM D 1556	(2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(2000) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

1.2.1 Base Course

Base course is Virginia Department of Transportation No. 21B dense graded Type I aggregate.

1.2.2 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only (FIO).

When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools; FIO

List of proposed equipment to be used in performance of construction work, including descriptive data.

Waybills and Delivery Tickets;

Copies of waybills and delivery tickets during the progress of the work. Before the final statement is allowed, the Contractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

SD-06 Test Reports

Sampling and testing; FIO

Field Density Tests; FIO

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results for approval not less than 30 days before material is required for the work.

1.4 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by a testing laboratory approved in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements; testing shall be performed at the specified frequency. The Contracting Officer may specify the time and location of the tests. Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of the tests.

1.4.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.4.2 Tests

The following tests shall be performed in conformance with the applicable standards listed.

1.4.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C 117 and ASTM D 442. Sieves shall conform to ASTM E 11.

1.4.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.4.2.3 Moisture-Density Determinations

The maximum density and optimum moisture content shall be determined in accordance with ASTM D 1557 or AASHTO T 180, Method D and corrected with AASHTO T 224. To maintain the same percentage of coarse material, the "remove and replace" procedure as described in NOTE 8 in paragraph 7.2 of AASHTO T 180 shall be used.

1.4.2.4 Field Density Tests

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. At least one test by method D1556 shall be performed for every eight tests, by method D2922, and results by method D2922 shall be adjusted according to the results by method D1556 which shall govern for contract compliance. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompact to meet specification requirements. Tests on recompact areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests.

1.4.3 Testing Frequency

1.4.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements when furnished. If materials from more than one source are going to be utilized, this testing shall be completed for each source.

- a. Sieve Analysis.
- b. Liquid limit and plasticity index.
- c. Abrasion Loss.
- d. Soundness.

1.4.3.2 In Place Tests

Each of the following tests shall be performed on samples taken from the placed and compacted Base Course. Samples shall be taken and tested at the rates indicated.

a. Density tests shall be performed on every lift of material placed and at a frequency of one set of tests for every 250 square yards, or portion thereof, of completed area.

b. Sieve Analysis shall be performed for every 500 tons, or portion thereof, of material placed.

c. Liquid limit and plasticity index tests shall be performed at the same frequency as the sieve analysis.

1.4.4 Approval of Material

The source of the material shall be selected 30 days prior to the time the material will be required in the work. Tentative approval of material will be based on initial test results. Final approval of the materials will be based on sieve analysis, liquid limit, and plasticity index tests performed on samples taken from the completed and fully compacted Base Course.

1.5 WEATHER LIMITATIONS

Construction shall be done when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

1.6 PLANT, EQUIPMENT, AND TOOLS

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregate shall consist of clean, sound, durable particles of crushed stone, crushed slag, or crushed gravel with or without soil mortar or other admixtures. Aggregate shall be free of silt and clay as defined by ASTM D 2487, organic matter, and other objectionable materials or coatings. Crushed gravel shall consist of particles of which at least 90% by weight of the material retained on the No. 10 sieve shall have at least one face fractured by artificial crushing.

2.1.1 Dense Graded Aggregate

When the aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements and shall be stockpiled separately.

a. Crushed Gravel: Crushed gravel shall be manufactured by crushing gravels and shall consist of particles of which at least 90% by weight of the material retained on the No. 10 sieve shall have at least one face fractured by artificial crushing.

b. Crushed Stone: Crushed stone shall consist of freshly mined quarry rock.

c. Crushed Slag: Crushed slag shall be an air-cooled blast-furnace product having an air dry unit weight of not less than 65 pcf as determined by ASTM C 29/C 29M.

2.1.2 Gradation Requirements

The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 1 1/2 inches and shall be continuously well graded within the limits specified in TABLE 1. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 1

2 inch	100
1 inch	85-95
3/8 inch	50-69
No. 10	20-36
No. 40	9-19
No. 200	4-7

NOTE 1: Particles having diameters less than 0.0008 inch shall not be in excess of 3 percent by weight of the total sample tested.

NOTE 2: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, they shall be tested in accordance with ASTM C 127 and ASTM C 128 to determine their specific gravities. If the specific gravities vary by more than 10 percent, the percentages passing the various sieves shall be corrected as directed by the Contracting Officer.

2.1.3 Liquid Limit and Plasticity Index

Liquid limit and plasticity index requirements shall apply to the completed course and shall also apply to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.1.4 Soundness

Soundness, when tested in accordance with the requirements of AASHTO T103

or T104, shall meet the requirements set forth in the table below.

USE	Max. Soundness Loss (%)	
	Magnesium Sulphate(5 Cycles)	Freeze and Thaw(100 Cycles)
Base Course	20	7

2.1.5 Abrasion Loss

Abrasion loss shall be not more than 45 percent when tested in accordance with the requirements of AASHTO T 96.

2.1.6 Optimum Moisture

Material shall be produced at optimum moisture +/-2 percentage points.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the Base Course is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 OPERATION OF AGGREGATE SOURCES

Aggregates shall be obtained from offsite sources.

3.3 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

3.4 PREPARATION OF UNDERLYING COURSE

Prior to constructing the Base Course, the underlying course or subgrade shall be cleaned of all foreign substances, and during construction, the underlying course shall contain no frozen material. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. The underlying course shall conform to Section 02300 Earthwork. Ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompact to specified density requirements. For cohesionless underlying courses containing sands or gravels, as defined in

ASTM D 2487, the surface shall be stabilized prior to placement of the base course. Stabilization shall be accomplished by mixing aggregate into the underlying course and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements of the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the separation geotextile fabric and base course are placed.

3.5 INSTALLATION

3.5.1 Mixing the Materials

The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Contractor shall make adjustments in mixing procedures or in equipment as directed to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory meeting of all requirements of this specification.

3.5.2 Placing

The mixed material shall be placed on the separation geotextile fabric in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the base course is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, and to adjust the water content.

3.5.3 Grade Control

The finished and completed base course shall conform to the lines, grades, and cross sections shown to accommodate the concrete paving section. Underlying material(s) shall be excavated and prepared at sufficient depth for the required base course thickness so that the finished surface course will meet the designated grades.

3.5.4 Edges of Base Course

The base course shall be placed so that the completed section will be a minimum of 5 feet wider, on all sides than the next layer that will be placed above it. Additionally, approved fill material shall be placed along the outer edges of base course in sufficient quantities to compact to the thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 2 foot width of this material to be rolled and compacted simultaneously with rolling and compacting of the base course. If this base course material is to be placed adjacent to another pavement section, then the layers for both of these sections shall be placed and compacted along this edge at the same time.

3.5.5 Compaction

The base course shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 2 percent of the optimum water content determined from laboratory tests as specified in paragraph SAMPLING AND TESTING. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer has a degree of compaction that is at least 100 percent of laboratory maximum density through the full depth of the layer. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation and , to reduce or increase water content. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

3.5.6 Thickness

Compacted thickness of the aggregate course shall be as indicated. No individual layer shall exceed 6 inches nor be less than 3 inches in compacted thickness. The total compacted thickness of the base course shall be within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 1/4 inch of the thickness indicated. The total thickness of the ABC and GCA course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

3.5.7 Finishing

The surface of the top layer of base course shall be finished after final compaction proof rolling by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of base course is 1/2 inch or more below grade, then the top layer should be scarified to a depth of at least 4 inches and new material shall be blended in and compacted to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompacted or it shall be replaced as directed.

3.5.8 Smoothness

The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 12 foot straightedge. Measurements shall be taken in successive positions parallel to the centerline of the area to be paved.

Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

3.6 TRAFFIC

Traffic shall not be allowed on the completed base course.

3.7 MAINTENANCE

The base course shall be maintained in a satisfactory condition until the full pavement section is completed and accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any base course that is not paved over prior to the onset of winter, shall be retested to verify that it still complies with the requirements of this specification. Any area of base course that is damaged shall be reworked or replaced as necessary to comply with this specification.

3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Any unsuitable materials that must be removed shall be disposed of as specified for unsatisfactory materials in Section 2300 EARTHWORK. No additional payments will be made for materials that must be replaced.

-- End of Section --

SECTION 02753A

CONCRETE PAVEMENT FOR AIRFIELDS
01/02

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

- | | |
|------------|---|
| ACI 211.1 | (1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete |
| ACI 214.3R | (1988; R 1997) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete |
| ACI 305R | (1999) Hot Weather Concreting |

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

- | | |
|--------------|---|
| AASHTO M 182 | (1991; R 1996) Burlap Cloth Made from Jute or Kenaf |
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-------------|--|
| ASTM A 184 | (2001) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement |
| ASTM A 185 | (1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement |
| ASTM A 497 | (1999) Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement |
| ASTM A 53 | (2001) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| ASTM A 615 | (2000) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement |
| ASTM A 616 | (1996a) Rail-Steel Deformed and Plain Bars for Concrete Reinforcement |
| ASTM A 617 | (1996a) Axle-Steel Deformed and Plain Bars for Concrete Reinforcement |
| ASTM C 1064 | (1999) Temperature of Freshly Mixed Portland Cement Concrete |

ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 123	(1998) Lightweight Particles in Aggregate
ASTM C 1240	(2000) Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar and Grout
ASTM C 1260	(1994) Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	(1978; R 1997) Clay Lumps and Friable Particles in Aggregates
ASTM C 143	(2000) Slump of Hydraulic Cement Concrete
ASTM C 150	(1999a) Portland Cement
ASTM C 171	(1997a) Sheet Materials for Curing Concrete
ASTM C 172	(1999) Sampling Freshly Mixed Concrete
ASTM C 174	(1997) Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C 192	(2000) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 29	(1997) Bulk Density ("Unit Weight") and Voids in Aggregates
ASTM C 295	(1998) Petrographic Examination of Aggregates for Concrete
ASTM C 31	(2000e1) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1999ae1) Concrete Aggregates

ASTM C 330	(2000) Lightweight Aggregates for Structural Concrete
ASTM C 39	(2001) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 470	(1998) Molds for Forming Concrete Test Cylinders Vertically
ASTM C 494	(1999ae1) Chemical Admixtures for Concrete
ASTM C 595	(2000a) Blended Hydraulic Cements
ASTM C 595M	(1997) Blended Hydraulic Cements (Metric)
ASTM C 618	(2000) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 78	(1994) Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 94	(2000e2) Ready-Mixed Concrete
ASTM C 989	(1999) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM D 1227	(1995) Emulsified Asphalt Used as a Protective Coating for Roofing
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996e1) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 3665	(1999) Random Sampling of Construction Materials
ASTM D 449	(1989; R 1999e1) Asphalt Used in Dampproofing and Waterproofing
ASTM D 946	(1982; R 1999) Penetration-Graded Asphalt Cement for Use in Pavement Construction

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44	(1997) NIST Handbook 44: Specifications, Tolerances, and other Technical Requirements for Weighing and Measuring Devices
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NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100 (1996) Concrete Plant Standards \n/c\$\X

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION (CDT)

CDT Test 526 (1978) Operation of California
Profilograph and Evaluation of Profiles

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 100 (1975) Method of Sampling Concrete
Aggregate and Aggregate Sources, and
Selection of Material for Testing

COE CRD-C 104 (1980) Method of Calculation of the
Fineness Modulus of Aggregate

COE CRD-C 114 (1997) Test Method for Soundness of
Aggregates by Freezing and Thawing of
Concrete Specimens

COE CRD-C 119 (1991) Standard Test Method for Flat or
Elongated Particles in Coarse Aggregate

COE CRD-C 130 (1989) Scratch Hardness of Coarse
Aggregate Particles

COE CRD-C 143 (1962) Specifications for Meters for
Automatic Indication of Moisture in Fine
Aggregate

COE CRD-C 171 (1995) Test Method for Determining
Percentage of Crushed Particles in
Aggregate

COE CRD-C 300 (1990) Specifications for Membrane-Forming
Compounds for Curing Concrete

COE CRD-C 400 (1963) Requirements for Water for Use in
Mixing or Curing Concrete

COE CRD-C 521 (1981) Standard Test Method for Frequency
and Amplitude of Vibrators for Concrete

COE CRD-C 540 (1971; R 1981) Standard Specification for
Nonbituminous Inserts for Contraction
Joints in Portland Cement Concrete
Airfield Pavements, Sawable Type

COE CRD-C 55 (1992) Test Method for Within-Batch
Uniformity of Freshly Mixed Concrete

COE CRD-C 572 (1974) Corps of Engineers Specifications
for Polyvinylchloride Waterstop

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-DTL-24441/20 (Rev. A) Paint, Epoxy-Polyamide, Green

Primer, Formula 150, Type III

1.2 SYSTEM DESCRIPTION

This section is intended to stand alone for construction of concrete (rigid) pavement. However, where the construction covered herein interfaces with other sections, the construction at each interface shall conform to the requirements of both this section and the other section, including tolerances for both. Incidental concrete construction required by this project shall comply with this section.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment;

a. Details and data on the batching and mixing plant prior to plant assembly including manufacturer's literature showing that the equipment meets all requirements specified herein.

b. A description of the equipment proposed for transporting concrete mixture from the central mixing plant to the paving equipment at least 7 days prior to start of paving unless otherwise specified.

c. At the time the materials are furnished for the mixture proportioning study, a description of the equipment proposed for the placing of the concrete mixture, method of control, and manufacturer's literature on the paver and finisher, together with the manufacturer's written instructions on adjustments and operating procedures necessary to assure a tight, smooth surface on the concrete pavement, free of tears and other surface imperfections, including excessive paste on the surface. The literature shall show that the equipment meets all details of these specifications.

Proposed Techniques; FIO

a. A description of the placing and protection methods proposed prior to construction of the test section, if concrete is to be placed in or exposed to hot or cold weather conditions.

b. A detailed plan of the proposed paving pattern showing all planned construction joints. No deviation from the jointing pattern shown on the drawings shall be made without written approval of the Norfolk District.

c. Data on the curing media and methods to be used.

Samples for Mixture Proportioning Studies; FIO

The results of the Contractor's mixture proportioning studies

along with a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of concrete at least 14 days prior to commencing concrete placing operations. Aggregate quantities shall be based on the mass in a saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, inspected by the Government, and approved in writing, showing that mixture proportioning studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture proportions without additional tests to show that the quality of the concrete is satisfactory.

Delivery, Storage, and Handling of Materials;

Copies of waybills or delivery tickets for cementitious material during the progress of the work. Before the final payment is allowed, waybills and certified delivery tickets shall be furnished for all cementitious material used in the construction.

SD-06 Test Reports

Sampling and Testing; FIO

Certified copies of laboratory test reports, including all test data, for cement, pozzolan, aggregate, admixtures, and curing compound proposed for use on this project. These tests shall be made by an approved commercial laboratory or by a laboratory maintained by the manufacturers of the materials. No material shall be used until notice of acceptance has been given. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site.

1.4 MEASUREMENT AND PAYMENT

1.4.1 Measurements

1.4.1.1 Mixture Proportions By Contractor

The Contractor shall be responsible for the mixture proportions of cementitious materials and chemical admixtures; no separate measurement or payment will be made for any cementitious material, including pozzolan, or for any chemical admixture.

1.5 ACCEPTABILITY OF WORK AND PAYMENT ADJUSTMENTS

Concrete samples shall be taken by the Contractor in the field to determine the slump, air content, and strength of the concrete. Test beams and test cylinders shall be made for determining conformance with the strength requirements of these specifications and, when required, for determining the time at which pavements may be placed into service. Any pavement not meeting the requirement for 'specified strength' shall be removed and replaced at no additional cost to the Government. The air content shall be determined in accordance with ASTM C 231. Slump tests shall be made in accordance with ASTM C 143. Test beams and cylinders shall be molded and cured in accordance with ASTM C 31 and as specified below. Steel molds shall be used for molding the beams specimens. Molds for cylinder test

specimens shall conform to ASTM C 470. The Contractor shall furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Laboratory curing facilities for test specimens shall include furnishing and operating water tanks equipped with temperature-control devices that will automatically maintain the temperature of the water at 73 plus or minus 5 degrees F. The Contractor shall furnish and maintain at the site boxes or other facilities suitable for storing the specimens while in the mold at a temperature of 73 plus or minus 10 degrees F. Tests of the fresh concrete and of the hardened concrete specimens shall be made by and at the expense of the Contractor.

1.5.1 Pavement Lots

Appropriate adjustment in payment for individual lots of concrete pavement will be made in accordance with the following paragraphs. No such adjustment in payment will be made for any material other than concrete. A lot will be that quantity of construction that will be evaluated for compliance with specification requirements. A lot will be equal to 400 cubic yards or one days production. In order to evaluate thickness, each lot will be divided into four equal sublots. Grade and surface smoothness (and condition) determinations will be made on the lot as a whole. However, any pavement not meeting the required 'specified strength' shall be removed and replaced at no additional cost to the Government. Strength will be evaluated, but will not be considered for payment adjustment. Edge slump requirements will be applied to each individual slab into which the primary paving lanes are divided by transverse joints, and will not be considered for payment adjustment. Samples for determining aggregate grading for fine aggregate and each size of coarse aggregate shall be taken as the aggregate bins discharge into the weight hoppers. Results of tests on aggregates shall be used to control aggregate production and concreting operations, as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL, but will not be used for payment adjustment. Samples for determining air content and slump and for fabricating strength specimens shall be taken in accordance with ASTM C 172 during or immediately following delivery of the concrete at the paving site and deposition of the concrete immediately in front of the paver or transfer spreader. Results of strength tests shall be used to control concreting operations, but will not be used for payment adjustment. Cores for thickness determination shall be drilled and evaluated as specified. Location of all samples shall be as directed and will be deliberately selected on a truly random basis, not haphazard, using commonly recognized methods of assuring randomness, employing randomizing tables or computer programs, in accordance with ASTM D 3665.

1.5.2 Acceptance of Lots

When a lot of material fails to meet the specification requirements, that lot will be accepted at a reduced price or shall be removed and replaced. The lowest computed percent payment determined for any pavement characteristic (i.e., thickness, grade, and surface smoothness) discussed below shall be the actual percent payment for that lot. The actual percent payment will be applied to the bid price and the quantity of concrete placed in the lot to determine actual payment.

1.5.3 Evaluation

The Contractor shall provide facilities for and, where directed, personnel to assist in obtaining samples for any Government testing, all at no

additional cost to the Government. Such testing will in no way relieve the Contractor of any specified testing responsibilities. The Contractor shall provide all sampling and testing required for acceptance and payment adjustment at its expense. Such sampling and testing shall be performed by a commercial testing laboratory inspected by the Government and approved in writing. The laboratory performing the tests shall be on-site and shall conform with ASTM C 1077. The individuals who sample and test concrete or the constituents of concrete as required in this specification shall be certified as American Concrete Institute (ACI) Concrete Field Testing Technicians, Grade I, or shall have otherwise demonstrated to the satisfaction of the Contracting Officer other training providing knowledge and ability equivalent to the ACI minimum requirements for certification. The individuals who perform the inspection of concrete shall be certified as ACI Concrete Construction Inspector, Level II, or have otherwise demonstrated to the satisfaction of the Contracting Officer other training providing knowledge and ability equivalent to the ACI minimum requirements for certification. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per year thereafter for conformance with ASTM C 1077.

1.5.4 Additional Sampling and Testing

The Contracting Officer reserves the right to direct additional samples and tests for any area which appears to deviate from the specification requirements. Testing in these areas will be in addition to the subplot or lot testing, and the requirements for these areas will be the same as those for a subplot or lot, but shall be at no additional cost to the Government.

1.5.5 Air Content Tests

Air content of the concrete shall be controlled as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL and will not be considered for payment adjustment.

1.5.6 Slump Tests

Slump of the concrete shall be controlled as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL and will not be considered for payment adjustment.

1.5.7 Surface Smoothness

The Contractor shall use the following method to test and evaluate surface smoothness of the pavement. All testing shall be performed in the presence of the Contracting Officer's representative. Detailed notes shall be kept of the results of the testing and a copy furnished to the Government immediately after each day's testing.

1.5.7.1 Smoothness Requirements

- a. Straightedge Testing: The finished surfaces of the pavements shall have no abrupt change of 1/8 inch or more, and all pavements shall be within the limits specified in Table 1 when checked with an approved 12 foot straightedge.

TABLE 1
STRAIGHTEDGE SURFACE SMOOTHNESS--PAVEMENTS

Pavement Category	Direction of Testing	Limits Inches
All Other Airfield Paved Areas	Longitudinal Transverse	1/4 1/4

1.5.7.2 Testing Method

After the concrete has hardened sufficiently to permit walking thereon, but not later than 36 hours after placement, the surface of the pavement in each entire lot shall be tested by the Contractor in such a manner as to reveal all surface irregularities exceeding the tolerances specified above.

However, transverse profilograph testing of multiple paving lanes shall be performed at the timing directed. Separate testing of individual sublots is not required. If any pavement areas are ground, these areas shall be retested immediately after grinding. The entire area of the pavement shall be tested in both a longitudinal and a transverse direction on parallel lines. The transverse lines shall be 15 feet or less apart, as directed. The longitudinal lines shall be at the centerline of each paving lane shown on the drawings, regardless of whether the Contractor is allowed to pave two lanes at a time, and at the 1/8th point in from each side of the lane. Other areas having obvious deviations shall also be tested. Longitudinal testing lines shall be continuous across all joints. Transverse testing lines for pilot lanes shall be carried to construction joint lines and for fill-in lanes shall be carried 24 inches across construction joints, and the readings in this area applied to the fill-in lane. Straightedge testing of the longitudinal edges of slipformed pilot lanes shall also be performed before paving fill-in lanes as specified in paragraph "Edge Slump and Joint Face Deformation".

- a. Straightedge Testing: The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length and measuring the maximum gap between the straightedge and the pavement surface, in the area between these two high points.

1.5.7.3 Payment Adjustment for Smoothness

- a. Straightedge Testing: Location and deviation from straightedge for all measurements shall be recorded. When between 5.0 and 10.0 percent of all measurements made within a lot exceed the tolerance specified in paragraph "Smoothness Requirements" above, after any reduction of high spots or removal and replacement, the computed percent payment based on surface smoothness will be 95 percent. When more than 10.0 percent and less than 15.0 percent of all measurements exceed the tolerance, the computed percent payment will be 90 percent. When between 15.0 and 20.0 percent of all measurements exceed the tolerance, the computed percent payment will be 75 percent. When 20.0 percent or more of the measurements exceed the tolerance, the lot shall be removed and replaced at no

additional cost to the Government. Regardless of the above, any small individual area with surface deviation which exceeds the tolerance given above by more than 50 percent shall be corrected by grinding to meet the specification requirements above or shall be removed and replaced at no additional cost to the Government.

1.5.8 Edge Slump and Joint Face Deformation

The following requirements on testing and evaluation of edge slump and joint face deformation apply only to pavements 10 inches or more in thickness. Use of slip-form paving equipment and procedures that fail to consistently provide edges within the specified tolerances on edge slump and joint face deformation shall be discontinued and the pavements shall be constructed by means of standard paving procedures using fixed forms. Slabs having more than the allowable edge slump shall be removed and replaced as specified in subparagraph "Excessive Edge Slump" before the adjacent lane is placed. Edge slump and joint face deformation will not be applied to payment adjustment. Tolerances shall be measured with an approved 12 foot statement edge.

1.5.8.1 Edge Slump

When slip-form paving is used, not more than 15.0 percent of the total free edge of any slab of the pavement, as originally constructed, shall have an edge slump exceeding 1/4 inch, and no slab shall have an edge slump exceeding 3/8 inch as determined in accordance with the measurements as specified in paragraph "Determination of Edge Slump". (The total free edge of the pavement will be considered to be the cumulative total linear measurement of pavement edge originally constructed as non-adjacent to any existing pavement; i.e., 100 feet of pilot lane, a paving lane originally constructed as a separate lane, will have 200 feet of free edge; 100 feet of fill-in lane will have no free edge, etc.,). The area affected by the downward movement of the concrete along the pavement edge shall not exceed 18 inches back from the edge. Tolerances shall be measured with an approved 12 foot straight edge.

1.5.8.2 Joint Face Deformation

In addition to the edge slump limits specified above, the vertical joint face shall have a surface within the maximum limits shown below:

Offset from Straightedge Applied Longitudinally To Pavement Surface 1 Inch Back From Joint Line		Offset From Straightedge Applied Longitudinally to Vertical Face	Offset From Straightedge Applied Top to Bottom Against the Joint Face	Abrupt Offset in Any Direction	Offset of Joint Face From True Vertical
Airfield Pavement	1/8 inch	1/4 inch	3/8 inch	1/8 inch	1 inch per 12 inches
All other Pavement	1/4 inch	All other items same as airfield pavement.			

1.5.8.3 Determination of Edge Slump

Immediately after the concrete has hardened sufficiently to permit walking thereon, the pavement surface shall be tested by the Contractor in the presence of a representative of the Contracting Officer. Testing shall be performed with a straightedge to reveal irregularities exceeding the edge slump tolerance specified above. The edge slump shall be determined at each free edge of each slipformed paving lane constructed. The straightedge shall be placed transverse to the direction of paving and the end of the straightedge located at the edge of the paving lane. Measurements shall be made at 5 to 15 foot spacings, as directed, commencing at the header where paving was started. Initially measurements shall be made at 5 foot intervals in each lane. When no deficiencies are present, the Contracting Officer may approve an increase in the interval. When any deficiencies exist, the interval will be returned to 5 feet. In no case shall the interval exceed 15 feet. In addition to the transverse edge slump determination above, the Contractor, at the same time, shall check the longitudinal surface smoothness of the joint on a continuous line 1 inch back from the joint line using the straightedge advanced one-half its length for each reading. Other tests of the exposed joint face shall be made as directed to ensure that a uniform, true vertical joint face is attained. These tests shall include longitudinal straightedge testing of the vertical face and vertical testing of the face for both smoothness and angle. The measurements shall be made by the Contractor, shall be properly referenced in accordance with paving lane identification and stationing, and a report given to the Contracting Officer within 24 hours after measurement is made. The report shall also identify areas requiring replacement in accordance with paragraph "Excessive Edge Slump" as well as the cumulative percentage of total free edge of pavement constructed to date which has an edge slump exceeding 1/4 inch.

1.5.8.4 Excessive Edge Slump

When edge slump exceeding the limits specified above is encountered on either side of the paving lane, additional straightedge measurements shall be made, if required, to define the linear limits of the excessive slump. The concrete for the entire width of the paving lane within these limits of excessive edge slump or joint deformation shall be removed and replaced in conformance with paragraph REPAIR, REMOVAL, REPLACEMENT OR SLABS. Partial slabs removed and replaced shall extend across the full width of the pavement lane, parallel to the transverse joints, and both the section of the slab removed and the section remaining in place shall have a minimum length of 10 feet to the nearest scheduled transverse joint. If less than 10 feet remains, the entire slab shall be removed and replaced. Adding concrete or paste to the edge or otherwise manipulating the plastic concrete after the sliding form has passed, or patching the hardened concrete, shall not be used as a method for correcting excessive edge slump.

1.5.9 Plan Grade

1.5.9.1 Plan Grade Tolerances

The finished surfaces of pavements shall conform, within the tolerances shown below, to the lines, and grades shown. The finished surfaces of airfield runway, taxiway, and apron pavements shall vary not more than 1/2 inch above or below the plan grade line or elevation indicated. The surfaces of other pavements shall vary not more than 3/4 inch. Plan grade shall be checked on the lot as a whole and when more than 5.0 and less than 10.0 percent of all measurements made within a lot are outside the specified tolerance, the computed percent payment for that lot will be 95 percent. When more than 10.0 percent are outside the specified tolerances,

the computed percent payment for the lot will be 75 percent. However, in any areas where the deviation from grade exceeds the specified tolerances by 50 percent or more, the deficient area shall be removed and replaced at no additional cost to the Government. However, the above deviations from the approved grade line and elevation will not be permitted in areas where closer conformance with the planned grade and elevation is required for the proper functioning of appurtenant structures. The finished surfaces of new abutting pavements shall coincide at their juncture.

1.5.9.2 Grade Conformance Tests

Each pavement category shall be checked by the Contractor for conformance with plan grade requirements. For the purpose of making grade conformance tests, the pavements will be subdivided into the same lots used for all other payment adjustment items. Within 5 days after paving of each lot, the finished surface of the pavement area in each lot shall be tested by the Contractor, in the presence of a representative of the Contracting Officer, by running lines of levels at intervals corresponding with every longitudinal and transverse joint to determine the elevation at each joint intersection. The results of this survey shall be recorded and a copy given to the Government at the completion of the survey of each lot.

1.5.10 Flexural Strength

Each lot of pavement will be evaluated for acceptance in accordance with the following procedures. The Contractor shall be responsible for all testing required herein. Testing shall be performed by an approved commercial laboratory. Results of strength tests will not be used for payment adjustment.

1.5.10.1 Sampling and Testing

One composite sample of concrete from each subplot shall be obtained in accordance with ASTM C 172 from one batch or truckload. Test cylinders, 6 x 12 in. shall be fabricated and cured in accordance with ASTM C 31/C; and tested in accordance with ASTM C 39. Two test cylinders per subplot (8 per lot) shall be fabricated and cured for compressive strength, and two tested at 14-day age and two at 28-day age. The remaining four shall be tested at the ages directed. At the same time 2 additional test cylinders per subplot to be used for CQC tests shall be fabricated and cured; and tested as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL. Two beams for flexural strength shall be fabricated and cured in accordance with ASTM C 31/C and tested in accordance with ASTM C 78 for every 2500 cubic yards of concrete. These shall be tested at the ages directed.

1.5.10.2 Computations

The following computations shall be performed:

- a. Average the eight 14-day compressive strength tests for the lot and also compute the standard deviation(s) for the eight tests.
- b. Convert the 14-day average compressive strength for the lot to equivalent 90-day average flexural strength for the lot, using the Correlation Ratio determined during mixture design studies.
- c. Report results of strength tests to the Contracting Officer daily. These values will be used for acceptance, but will not be used

for payment adjustment.

1.5.11 Thickness

Each lot of pavement will be evaluated for acceptance and payment adjustment in accordance with the following procedure. The Contractor shall be responsible for drilling the cores, measuring the cores in the presence of the Contracting Officer's representative, and for filling the core holes as directed.

1.5.11.1 Drilling, Measuring, and Computations

Two cores, between 3 and 6 in. in diameter, shall be drilled from the pavement, per subplot (8 per lot). The Contractor shall fill the core holes with concrete containing an expanding admixture, as directed. The cores shall be evaluated for thickness of the pavement in accordance with ASTM C 174/C. The pavement thickness from the 8 cores for the lot shall be averaged and the standard deviation for the 8 thickness measurements shall be computed.

1.5.11.2 Evaluation and Payment Adjustment for Thickness

Using the Average Thickness of the lot, the computed percent payment for thickness shall be determined by entering the following table:

Pavements Over 8 inches In Thickness

Deficiency in Thickness Determined by Cores Inches	Computed Percent Payment for Thickness
0.00 to 0.24	100
0.25 to 0.49	75
0.50 to 0.74	50
0.75 or greater	0

Where 0 percent payment is indicated, the entire lot shall be removed and replaced at no additional cost to the Government. Where either of the two cores from a subplot show a thickness deficiency of 0.75 inch or greater, two more cores shall be drilled in the subplot and the average thickness of the four cores computed. If this average shows a thickness deficiency of 0.75 inch or more the entire subplot shall be removed.

1.5.12 Partial Lots

When operational conditions cause a lot to be terminated before the specified four sublots have been completed, the following procedure shall be used to adjust the lot size and number of tests for the lot. Where three sublots have been completed, they shall constitute a lot and acceptance criteria adjusted accordingly. Where one or two sublots have been completed, they shall be incorporated into the next lot or the previous lot, as directed, and the total number of sublots shall be used and acceptance criteria adjusted accordingly.

1.5.13 Areas Defective in Plan Grade or Smoothness

In areas not meeting the specified limits for surface smoothness and plan grade, high areas shall be reduced to attain the required smoothness and grade, except as depth is limited below. High areas shall be reduced either by hand rubbing the freshly finished concrete with a silicon carbide brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 14 days or more old. Rubbing with a silicon carbide brick and water shall be discontinued as soon as contact with the coarse aggregate is made, and all further necessary reduction shall be accomplished by grinding the hardened concrete with a surface-grinding machine after it is 14 days old. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and shall not exceed 1 percent of the total area of any subplot. The depth of grinding shall not exceed 1/4 inch. All pavement areas requiring plan grade or surface smoothness corrections in excess of the limits specified above, shall be removed and replaced in conformance with paragraph REPAIR, REMOVAL, REPLACEMENT OF SLABS. In pavement areas given a wire comb or tined texture, areas exceeding 25 square feet that have been corrected by rubbing or grinding shall be retextured by transverse grooving using an approved grooving machine of standard manufacture. The grooves shall be 1/8 inch deep by 1/4 inch wide on 2 inch centers and shall be carried into, and tapered to zero depth within the non-corrected surface, or shall match any existing grooves in the adjacent pavement. All areas in which rubbing or grinding has been performed will be subject to the thickness tolerances specified in paragraph Thickness. Any rubbing or grinding performed on individual slabs with excessive deficiencies shall be performed at the Contractor's own decision without entitlement to additional compensation if eventual removal of the slab is required.

1.6 ACCEPTABILITY OF WORK

The materials and the pavement itself will be accepted on the basis of tests made by the Government and by the Contractor's approved commercial laboratory or the supplier's approved laboratory, all as specified herein. The Government may, at its discretion, make check tests to validate the results of the Contractor's testing. If the results of the Government and Contractor tests vary by less than 2.0 percent, of the Government's test results, the results of the Contractor's tests will be used. If the results of the Government and Contractor tests vary by 2.0 percent or more, but less than 4.0 percent, the average of the two will be considered the value to be used. If these vary by 4.0 percent or more, each sampling and testing procedure shall be carefully evaluated and both the Government and the Contractor shall take another series of tests on duplicate samples of material. If these vary by 4.0 percent or more, the results of the tests made by the Government shall be used and the Government will continue check testing of this item on a continuous basis until the two sets of tests agree within less than 4.0 percent on a regular basis. Testing performed by the Government will in no way at any time relieve the Contractor from the specified testing requirements.

1.7 PRECONSTRUCTION TESTING OF MATERIALS

The Contractor shall not be entitled to any additional payment or extension of time because of delays caused by sampling and testing additional sources, or samples, necessitated by failure of any samples.

1.7.1 Aggregates

Aggregates shall be sampled by the Contractor in the presence of a Government representative. Samples shall be obtained in accordance with COE CRD-C 100 and of the size indicated therein, or larger if specified in paragraph Testing Sequence Deleterious Materials -- Airfields Only and shall be representative of the materials to be used for the project. Testing of samples shall be the responsibility of the Contractor and shall be performed by an approved commercial laboratory. Test results shall be submitted 30 days before commencing paving. No material shall be used unless test results show that it meets all requirements of these specifications.

1.7.2 Chemical Admixtures

The Contractor shall provide satisfactory facilities for ready procurement of adequate test samples. All sampling and testing of an admixture will be by and at the expense of the Government. Tests will be conducted with materials proposed for the project. An air-entraining admixture that has been in storage at the project site for longer than 6 months or that has been subjected to freezing will be retested at the expense of the Contractor when considered appropriate and shall be rejected if test results are not satisfactory.

1.7.3 Curing Compound

The Contractor shall provide satisfactory facilities for ready procurement of adequate test samples.

1.7.4 Epoxy-Resin Material

At least 30 days before the material is used, the Contractor shall submit certified copies of test results showing that the specific lots or batches from which the material will be furnished to this project have been tested by the manufacturer and that the material conforms to the requirements of these specifications. When epoxy resin arrives at the job site, the Contractor shall assist the Government to sample the material. The Government will test the sample or will retain it in storage for possible future testing, as considered appropriate.

1.7.5 Cements, Pozzolans, and GGBF Slag

Preconstruction sampling and testing of cement and pozzolan shall conform to the requirements specified for sampling and testing during construction except that test results showing that each material meets specification requirements shall be available at least 5 days before start of paving operations.

1.8 TESTING BY CONTRACTOR DURING CONSTRUCTION

1.8.1 Contractor's Testing Requirements

During construction, the Contractor shall be responsible for sampling and testing aggregates, cementitious materials (cement and pozzolan), and concrete to determine compliance with the specifications. All sampling and testing shall be performed by an approved commercial laboratory, or for cementitious materials, the manufacturer's laboratory. Samples of aggregate shall be obtained as the bins discharge into the weigh hopper. Samples of concrete shall be obtained at the point of delivery to the paver. The Government will sample and test concrete and ingredient materials as considered appropriate. The Contractor shall provide

facilities and labor as may be necessary for procurement of representative test samples. Testing by the Government will in no way relieve the Contractor of the specified testing requirements.

1.8.2 Cementitious Materials

Cement and pozzolan will be accepted on the basis of manufacturer's certification of compliance, accompanied by mill test reports showing that the material in each shipment meets the requirements of the specification under which it is furnished. No cementitious material shall be used until notice of acceptance has been given by the Contracting Officer. Cementitious material may be subjected to check testing by the Government from samples obtained at the mill, at transfer points, or at the project site.

1.9 QUALIFICATIONS

All Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades (or shall have approved written evidence of having completed similar qualification programs):

Concrete Field Testing Technician, Grade I
Concrete Laboratory Testing Technician, Grade I or II
Concrete Construction Inspector, Level II

The foreman or lead journeyman of the finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher, or equal. Written documentation shall be furnished for each workman in the above groups.

1.10 TEST SECTION

At least 10 days but not more than 60 days prior to construction of the concrete pavement, a test section shall be constructed as part of the production paving area at an outer edge. If part of the production paving area, the test section will be allowed to remain in place, if meeting all specification requirements and will be paid for as part of the production pavement. There will be no separate payment for the test section or sections and the cost of the materials, and the construction will be considered a subsidiary cost of constructing the project. The Contractor shall notify the Contracting Officer at least 5 days in advance of the date of test section construction. The test section shall consist of one paving lane at least 400 feet long and shall be constructed to a thickness as required on the drawings. The lane width shall be the same as that required for use in the project. The test section shall contain at least one transverse construction joint. If keyed or doweled longitudinal construction joints are required in any of the production pavements, they shall be installed full length along one side of the test strip throughout the test section. If both keys and dowels are required, each shall be installed in half of the test section. The Contractor shall use the test section to develop and demonstrate to the satisfaction of the Contracting Officer the proposed techniques of mixing, hauling, placing, consolidating, finishing, curing, start-up procedures, testing methods, plant operations, and the preparation of the construction joints. Variations in mixture proportions other than water shall be made if directed. The test section shall be placed as approved by the Government. The Contractor shall vary the water content, as necessary, to arrive at the appropriate content. The mixing plant shall be operated and calibrated prior to start of placing the

test section. The Contractor shall use the same equipment, materials, and construction techniques on the test section as will be used in all subsequent work. Base course preparation, concrete production, placing, consolidating, curing, construction of joints, and all testing shall be in accordance with applicable provisions of this specification. The Contractor shall construct the test section meeting all specification requirements and being acceptable to the Contracting Officer in all aspects, including surface texture. Failure to construct an acceptable test section will necessitate construction of additional test sections at no additional cost to the Government. Test sections allowed to be constructed as part of the production paving which do not meet specification requirements shall be removed at the Contractor's expense. Any test sections unacceptable to the Contracting Officer shall be removed at the Contractor's expense. If the Contractor proposes to use slipform paving and is unable to construct an acceptable test section, or if the slipform paving equipment and procedures are found to be unable to produce acceptable pavement at any time, the slipform paving equipment shall be removed from the job and the construction completed using stationary side forms and equipment compatible with them. The Contractor shall provide four cores at least 6 inch diameter and 2 beams at least 6 by 32 inches by full depth (or 4 beams at least 6 by 20 inches by full depth) cut from points selected in the test section by the Government, 5 days after completion of the test section. The Contractor shall trim the beams to dimensions directed before delivery for inspection and testing, as considered appropriate. Production paving may be started immediately after the results of 7-day tests of the cores (and the sawed beams) have been approved and after approval of the test section.

1.11 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

1.11.1 Bulk Cementitious Materials

All cementitious material shall be furnished in bulk. The temperature of the cementitious material, as delivered to storage at the site, shall not exceed 150 degrees F.

1.11.1.1 Transportation

When bulk cementitious material is not unloaded from primary carriers directly into weather-tight hoppers at the batching plant, transportation from the railhead, mill, or intermediate storage to the batching plant shall be accomplished in adequately designed weather-tight trucks, conveyors, or other means that will protect the cementitious material from exposure to moisture.

1.11.1.2 Storage Requirements

Immediately upon receipt at the site of the work, cementitious materials shall be stored in a dry and properly ventilated structure. All storage facilities shall be subject to approval and shall allow easy access for inspection and identification. Sufficient cementitious materials shall be in storage to sustain continuous operation of the concrete mixing plant while the pavement is being placed. To prevent cement from becoming unduly aged after delivery, any cement that has been stored at the site for 60 days or more shall be used before using cement of lesser age.

1.11.1.3 Separation of Materials

Separate facilities shall be provided which will prevent any intermixing

during unloading, transporting, storing, and handling of each type of cementitious material.

1.11.2 Aggregate Materials

1.11.2.1 Storage

Aggregate shall be stored at the site of the batching and mixing plant avoiding breakage, segregation, or contamination by foreign materials. Each size of aggregate from each source shall be stored separately in free-draining stockpiles. Fine aggregate and the smallest size coarse aggregate shall remain in free-draining storage for at least 24 hours immediately prior to use. Sufficient aggregate shall be maintained at the site at all times to permit continuous uninterrupted operation of the mixing plant at the time concrete pavement is being placed.

1.11.2.2 Handling

Aggregate shall be handled avoiding segregation or degradation. Vehicles used for stockpiling or moving aggregate shall be kept clean of foreign materials. Tracked equipment shall not be allowed on coarse aggregate stockpiles. Stockpiles shall be built up and worked avoiding segregation in the piles and preventing different sizes of aggregate from being mixed during storage or batching. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed and unused.

1.11.3 Other Materials

Reinforcing bars and accessories shall be stored above the ground on platforms, skids, or other supports. Other materials shall be stored avoiding contamination and deterioration. Chemical admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements. The Contractor shall ensure that materials can be accurately identified after bundles or containers are opened.

1.12 EQUIPMENT

All plant, equipment, tools, and machines used in the work shall be maintained in satisfactory working conditions at all times.

1.12.1 Batching and Mixing Plant

1.12.1.1 Location of Batching and Mixing Plant

The batching and mixing plant should the Contractor choose to utilize a Batch Plant shall be located off Government premises no more than 15 minutes haul time from the placing site. There shall be operable telephonic or radio communication between the batching plant and the placing site at all times concreting is taking place.

1.12.1.2 Type and Capacity of Batching and Mixing Plant

The batching and mixing plant shall be a stationary-type plant. The plant shall be designed and operated to produce concrete within the specified tolerances, and shall have a capacity of at least 250 cu. yd. per hour. The batching plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are

not required.

1.12.1.3 Equipment Requirements

The batching controls shall be either semiautomatic or automatic. Semiautomatic batching system shall be provided with interlocks. Separate bins or compartments shall be provided for each size group of aggregate and each cementitious material. Aggregates shall be weighed either in separate weigh batchers with individual scales or cumulatively in one weigh batcher on one scale, provided the fine aggregate is weighed first. Aggregate shall not be weighed in the same batcher with cementitious material. If both cement and pozzolan are used, they may be batched cumulatively, provided portland cement is batched first. Water shall not be weighed or measured cumulatively with another ingredient. Water batcher filling and discharging valves shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. An accurate mechanical device for measuring and dispensing each chemical admixture shall be provided. Each dispenser shall be interlocked with the batching cycle and discharged automatically to obtain uniform distribution throughout the batch in the specified mixing period. Different chemical admixtures shall not be combined before introduction in water and cement. The plant shall be arranged to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment.

1.12.1.4 Scales

Adequate facilities shall be provided for the accurate measurement and control of each of the materials entering each batch of concrete. The weighing equipment shall conform to the applicable requirements of NIST HB 44, except that the accuracy shall be within 0.2 percent of scale capacity.

The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring device. Each weighing unit shall include a visible springless dial, which shall indicate the scale load at all stages of the weighing operation or shall include a beam scale with a beam balance indicator that will show the scale in balance at zero load and at any beam setting. The indicator shall have an over and under travel equal to at least 5 percent of the capacity of the beam. Approved electronic digital indicators and load cells may also be used. The weighing equipment shall be arranged to allow the concrete plant operator to conveniently observe the dials or indicators.

1.12.1.5 Batching Tolerances

The following tolerances shall apply.

Materials	Percentage of Required Mass
Cement (and Pozzolan)	plus or minus 1
Aggregate	plus or minus 2
Water	plus or minus 1
Admixture	plus or minus 3

For volumetric batching equipment for water and admixtures, the above numeric tolerances shall apply to the required volume of material being batched. Concentrated admixtures shall be uniformly diluted, if necessary,

to provide sufficient volume per batch to ensure that the batchers will consistently operate within the above tolerance.

1.12.1.6 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture contents of the aggregates and to change the quantities of the materials being batched. An electric moisture meter complying with the provisions of COE CRD-C 143 shall be provided for measuring of moisture in the fine aggregate. The sensing element shall be arranged so that measurement is made near the batcher charging gate of the fine aggregate bin or in the fine aggregate batcher.

1.12.1.7 Recorders

A graphic or digital recorder conforming to the requirements of NRMCA CPMB 100 shall be furnished and kept operational at the batching plant.

1.12.2 Concrete Mixers

Mixers shall be stationary mixers. Truck mixers shall not be used for mixing or transporting paving concrete. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. The mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Mixer blades or paddles shall be replaced when worn down more than 10 percent of their depth when compared with the manufacturer's dimension for new blades or paddles.

1.12.2.1 Stationary, Central Plant, Mixers

Stationary mixers shall be drum mixers of tilting or nontilting vertical-shaft type. Mixers shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed.

1.12.2.2 Mixing Time and Uniformity

- a. Stationary Mixers: For stationary mixers, before uniformity data are available, the mixing time for each batch after all solid materials are in the mixer, provided that all of the mixing water is introduced before one-fourth of the mixing time has elapsed, shall be 1 minute for mixers having a capacity of 1 cubic yard. For mixers of greater capacity, this minimum time shall be increased 20 seconds for each additional 1.33 cubic yard or fraction thereof. After results of uniformity tests are available, the mixing time may be reduced to the minimum time required to meet uniformity requirements; but if uniformity requirements are not being met, the mixing time shall be increased as directed. Mixer performance tests at new mixing times shall be performed immediately after any change in mixing time. When regular testing is performed, the concrete shall meet the limits of any five of the six uniformity requirements listed in Table 4, below. When abbreviated testing is performed, the concrete shall meet only those requirements listed for abbreviated testing. The concrete proportions used for uniformity tests shall be as used on the project. Regular testing shall consist of performing all six

tests on three batches of concrete. The range for regular testing shall be the average of the ranges of the three batches. Abbreviated testing shall consist of performing the three required tests on a single batch of concrete. The range for abbreviated testing shall be the range for one batch. If more than one mixer is used and all are identical in terms of make, type, capacity, condition, speed of rotation, etc., the results of tests on one of the mixers shall apply to the others, subject to the approval of the Contracting Officer. All mixer performance (uniformity) testing shall be performed by the Contractor in accordance with COE CRD-C 55 and with paragraph titled TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL.

TABLE 4
UNIFORMITY REQUIREMENTS--STATIONARY MIXERS

Parameter	Regular Tests Allowable Maximum Range for Average of 3 Batches	Abbreviated Tests Allowable Maximum Range for 1 Batch
Unit weight of air-free mortar, lb/cubic ft	2.0	2.0
Air content, percent	1.0	--
Slump, inches	25	--
Coarse aggregate, percent	6.0	6.0
Compressive strength at 7 days, percent	10.0	10.0
Water content, percent	1.5	--

1.12.3 Transporting Equipment

Concrete shall be transported to the paving site in nonagitating equipment conforming to ASTM C 94 or in approved agitators. All transporting equipment shall be designed and operated to deliver and discharge the required concrete mixture completely without segregation.

1.12.4 Transfer and Spreading Equipment

Equipment for transferring concrete from the transporting equipment to the paving lane in front of the paver shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will transfer and spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently. The travelling surge hopper shall be a specially manufactured, self-propelled transfer-placer which will operate in front of the paver and accept the concrete from the transporting equipment outside the paving lane, store it as necessary, and feed it out evenly across the lane in front of the paver at a depth which permits the paver to operate efficiently. The capacity shall be such that concrete is always available in front of the paver, to prevent the need for stopping the paver. It shall be designed to always discharge the oldest concrete remaining in the hopper before the fresher concrete.

1.12.5 Paver-Finisher

The paver-finisher shall be a heavy-duty, self-propelled machine designed specifically for paving and finishing high quality pavement. The paver-finisher shall weigh at least 2200 lb. per foot of lane width, and shall be powered by an engine having at least 6.0 horsepower per foot of lane width. The paver-finisher shall spread, consolidate, and shape the plastic concrete to the desired cross section in one pass. The mechanisms for forming the pavement shall be easily adjustable in width and thickness and for required crown. In addition to other spreaders required by paragraph Transfer and Spreading Equipment, the paver-finisher shall be equipped with a full width knock-down auger or paddle mechanism, capable of operating in both directions, which will evenly spread the fresh concrete in front of the screed or extrusion plate. Immersion vibrators shall be gang mounted at the front of the paver on a frame equipped with suitable controls so that all vibrators can be operated at any desired depth within the slab or completely withdrawn from the concrete, as required. The vibrators shall be automatically controlled so that they will be immediately stopped as forward motion of the paver ceases. The spacing of the immersion vibrators across the paving lane shall be as necessary to properly consolidate the concrete, but the clear distance between vibrators shall not exceed 30 inches. Spud vibrators shall operate at a frequency of not less than 8000 impulses per minute and an amplitude of not less than 0.03 inch and tube vibrators at a frequency of not less than 5000 impulses per minute and an amplitude of not less than 0.03 inch, as determined by COE CRD-C 521. The paver-finisher shall be equipped with a transversely oscillating screed or an extrusion plate to shape, compact, and smooth the surface and shall so finish the surface that no significant amount of hand finishing, except use of cutting straightedges, is required. The screed or extrusion plate shall be constructed to provide adjustment for crown in the pavement. The entire machine shall provide adjustment for variation in lane width or thickness and to prevent more than 8 inches of the screed or extrusion plate extending over previously placed concrete on either end when paving fill-in lanes. Machines that cause displacement of properly installed forms or cause ruts or indentations in the prepared underlying materials and machines that cause frequent delays due to mechanical failures shall be replaced as directed.

1.12.5.1 Paver-Finisher with Fixed Forms

The paver-finisher shall be equipped with wheels designed to keep it aligned with the forms and to spread the load so as to prevent deformation of the forms.

1.12.5.2 Slipform Paver-Finisher

The slipform paver-finisher shall be automatically controlled and crawler mounted with four padded tracks so as to be completely stable under all operating conditions. The paver-finisher shall finish the surface and edges so that no edge slump beyond allowable tolerance occurs. Horizontal alignment shall be electronically referenced to a taut wire guideline. Vertical alignment shall be electronically referenced on both sides of the paver to a taut wire guideline, to an approved laser control system, or, only where permitted by paragraph Slipform Paving, to a ski operating on a completed lane. Suitable moving side forms shall be provided that are adjustable and will produce smooth, even edges, perpendicular to the top surface and meeting specification requirements for alignment and freedom from edge slump.

1.12.5.3 Longitudinal Mechanical Float

A longitudinal mechanical float shall be specially designed and manufactured to smooth and finish the pavement surface without working excess paste to the surface. It shall be rigidly attached to the rear of the paver-finisher or to a separate self-propelled frame spanning the paving lane. The float plate shall be at least 5 feet long by 8 inches wide and shall automatically be oscillated in the longitudinal direction while slowly moving from edge to edge of the paving lane, with the float plate in contact with the surface at all times.

1.12.5.4 Nonrotating Pipe Float

A pipe float if used, shall be a nonrotating pipe 6 to 10 inches in diameter and sufficiently long to span the full paving width when oriented at an angle of approximately 60 degrees with the centerline. The pipe float shall be mounted on a self-propelled frame that spans the paving lane. No means of applying water to the surface shall be incorporated in the pipe float.

1.12.5.5 Other Types of Finishing Equipment

Clary screeds or other rotating tube floats, or bridge deck finishers, shall not be allowed on the project. Concrete finishing equipment of types other than specified above may be demonstrated on a test section outside the production pavement if approved in writing. If the Contracting Officer's representative decides from evaluation of the test section that the equipment is better than the specified finishing equipment, its use will be permitted as long as it continues to perform better than the specified equipment.

1.12.6 Curing Equipment

Equipment for applying membrane-forming curing compound shall be mounted on a self-propelled frame that spans the paving lane. The reservoir for curing compound shall be constantly mechanically (not air) agitated during operation and shall contain means for completely draining the reservoir. The spraying system shall consist of a mechanically powered pump which will maintain constant pressure during operation, an operable pressure gauge, and either a series of spray nozzles evenly spaced across the lane to give uniformly overlapping coverage or a single spray nozzle which is mounted on a carriage which automatically traverses the lane width at a speed correlated with the forward movement of the overall frame. All spray nozzles shall be protected with wind screens. Any hand-operated sprayers allowed by paragraph Membrane Curing shall be compressed air supplied by a mechanical air compressor. If the curing machine fails to apply an even coating of compound at the specified rate, it shall immediately be replaced.

1.12.7 Texturing Equipment

Texturing equipment shall be as specified below. Before use, the texturing equipment shall be demonstrated on a test section, and the equipment shall be modified as necessary to produce the texture directed.

1.12.7.1 Fabric Drag

A fabric drag shall consist of a piece of material as long as the lane width securely attached to a separate wheel mounted frame spanning the

paving lane or to one of the other similar pieces of equipment. Width of the material shall provide 12 to 18 inches dragging flat on the pavement surface. Length shall be at least equal to the width of the slab plus 24 inches. The material shall be clean, reasonably new burlap, completely saturated with water before attachment to the frame and always resaturated before start of use and kept clean and saturated during use. Burlap shall conform to AASHTO M 182, Class 3 or 4.

1.12.7.2 Deep Texturing Equipment

Texturing equipment shall consist of a stiff bristled broom forming a drag at least 4 feet long. This drag shall be mounted in a wheeled frame spanning the paving lane and so constructed that the drag is mechanically pulled in a straight line across the paving lane perpendicular to the centerline.

1.12.8 Sawing Equipment

Equipment for sawing joints and for other similar sawing of concrete shall be standard diamond-type concrete saws mounted on a wheeled chassis which can be easily guided to follow the required alignment. Blades shall be diamond tipped. If demonstrated to operate properly, abrasive blades may be used. [Wheel saws shall be saws with large diameter tungsten carbide tipped blades mounted on a heavy-duty chassis which will produce a saw kerf at least 1-1/2 inch wide.] All saws shall be capable of sawing to the full depth required.

1.12.9 Straightedge

The Contractor shall furnish and maintain at the job site, in good condition, one 12 foot straightedge for each paving train for testing the hardened portland cement concrete surfaces. These straightedges shall be constructed of aluminum or magnesium alloy and shall have blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Straightedges shall have handles for operation on the pavement.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious materials shall be portland cement, or only portland cement in combination with pozzolan and shall conform to appropriate specifications listed below. Temperature of cementitious materials as supplied to the project shall not exceed 150 degrees F.

2.1.1 Portland Cement

Portland cement shall conform to ASTM C 150, Type I or II, and shall be low-alkali.

2.1.2 Pozzolan (Fly Ash and Silica Fume)

2.1.2.1 Fly Ash

Fly ash shall conform to ASTM C 618, Class F with the optional requirements in for multiple factor drying shrinkage, and uniformity from Table 2A. The fly ash shall meet the optional requirements on limits of alkalis in Table IA of ASTM C 618. Fly Ash shall be used only at a rate between 15

and 35 percent of the total cementitious material by mass..

2.1.2.2 Silica Fume

Silica fume shall conform to ASTM C 1240; available alkalies shall conform to the optimal limit given in Table 2. Silica fume may be furnished as a dry, densified material or as a slurry. The Contractor shall provide at his expense the services of a manufacturer's technical representative, experienced in mixing, proportioning, placement procedures, and curing of concrete containing silica fume. This representative shall be present on the project prior to and during at least the first 4 days of concreting using silica fume.

2.2 AGGREGATES

In addition to the grading requirements specified for coarse aggregate and for fine aggregate, the combined aggregate grading shall meet the following requirements.

- a. If necessary, a blending aggregate shall be used to meet the required combined grading. This blending aggregate shall be batched separately. The combined grading of all aggregates used, in the proportions selected, shall be computed on the basis of cumulative percent retained on each sieve specified for fine and coarse aggregate.
- b. The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (W) are plotted on a diagram as described in d. below, the point thus determined shall fall within the parallelogram described therein.
- c. The Coarseness Factor (CF) shall be determined from the following equation:

$$CF = (\text{cumulative percent retained on the } 3/8 \text{ in. sieve}) (100) / (\text{cumulative percent retained on the No. 8 sieve})$$

The Workability Factor (W) is defined as the cumulative percent passing the No. 8 sieve. However, W shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds of cementitious material per cubic yard greater than 564 pounds per cubic yard.

- d. A diagram shall be plotted using a rectangular scale with W on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, W-28), (CF-75, W-40), (CF-45, W-32.5), and (CF-45, W-41). If the point determined by the intersection of the computed CF and W does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary.
- e. In addition, the individual percent retained on each sieve shall be plotted for the combined aggregate grading, on either rectangular or semi-log graph paper. The graph shall show a relative smooth transition between coarse and fine aggregate and shall have no major valleys or peaks in the area smaller than the

No. 8 sieve. If this plot does not meet the above criteria, the grading of each size aggregate used and the proportions selected shall be changed as necessary.

2.2.1 Aggregate Sources

Fine and coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with ASTM C 1260. Both coarse aggregate size groups shall be tested if from different sources. Test results shall have a measured expansion equal to or less than 0.08 percent at 16 days after casting. Should the test data indicate an expansion greater than 0.08 percent, the aggregate(s) shall be rejected and the Contractor shall submit new aggregate sources for retesting. The results of the testing shall be submitted to the Contracting Officer for evaluation and acceptance.

2.2.2 Coarse Aggregate

Coarse aggregate shall have a satisfactory service record of at least 5 years successful service in three paving projects or, if a new source is used, shall meet the requirements when tested for resistance to freezing and thawing.

2.2.2.1 Material Composition

Coarse aggregate shall consist of crushed gravel, crushed stone, or a combination thereof. Crushed gravel shall contain not less than 75 percent of crushed particles by mass in each sieve size, as determined by COE CRD-C 171.

2.2.2.2 Quality

Aggregates as delivered to the mixers shall consist of clean, hard, uncoated particles meeting the requirements of ASTM C 33 and other requirements specified herein. Coarse aggregate shall be washed. Washing shall be sufficient to remove dust and other coatings.

2.2.2.3 Particle Shape Characteristics

Particles of the coarse aggregate shall be generally spherical or cubical in shape. The quantity of flat and elongated particles in any size group shall not exceed 20 percent by weight as determined by COE CRD-C 119. A flat particle is defined as one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3.

2.2.2.4 Size and Grading

The nominal maximum size of the coarse aggregate shall be 1.50 inches and shall meet the size groups below. When the nominal maximum coarse size is greater than 1 inch, the aggregates shall be furnished in two size groups as follows:

Nominal Maximum Size Inches	Size Group
<hr/>	<hr/>
3/4	ASTM C 33 --No.67 (No. 4 to 3/4 inch)

Nominal Maximum Size Inches	Size Group
1-1/2	ASTM C 33 --No. 4 (3/4 to 1-1/2 inch)

The grading of the coarse aggregate within the separated size groups shall conform to the requirements of ASTM C 33, Sizes 67 and 4 as delivered to the mixer.

2.2.2.5 Deleterious Materials - Airfield Pavements

The amount of deleterious material in each sieve size of coarse aggregate shall not exceed the limits shown in Table 5 below, determined in accordance with the test methods shown.

TABLE 5
LIMITS OF DELETERIOUS MATERIALS IN COARSE AGGREGATE
FOR AIRFIELD PAVEMENTS
Percentage by Mass

Materials	Areas with Minor Popouts Severe Weather
Clay lumps and friable particles (ASTM C 142)	2.0
Shale (a) (ASTM C 295)	1.0
Material finer than 0.075 mm (No. 200 sieve) (b) (ASTM C 117)	1.0
Lightweight particles (c) (ASTM C 123)	0.5
Clay ironstone (d) (ASTM C 295)	1.0
Chert and cherty stone (less than 2.40 Mg/cubic meter density SSD (2.40 Sp. Gr.)) (e) (ASTM C 295)	1.0
Claystone, mudstone, and siltstone (f) (ASTM C 295)	1.0
Shaly and argillaceous limestone (g) (ASTM C 295)	1.0
Other soft particles	1.0

TABLE 5
LIMITS OF DELETERIOUS MATERIALS IN COARSE AGGREGATE
FOR AIRFIELD PAVEMENTS
Percentage by Mass

Materials	Areas with Minor Popouts Severe Weather
<hr/>	
COE CRD-C 130	
Total of all deleterious substances exclusive of material finer than 0.075 mm (No. 200 sieve)	3.0
<p>a. Shale is defined as a fine-grained, thinly laminated or fissile sedimentary rock. It is commonly composed of clay or silt or both. It has been indurated by compaction or by cementation, but not so much as to have become slate.</p> <p>b. Limit for material finer than No. 200 sieve will be increased to 1.5 percent for crushed aggregates if the fine material consists of crusher dust that is essentially free from clay or shale.</p> <p>c. The separation medium shall have a density of 2.0 Mg/cubic meter Sp. Gr. of 2.0. This limit does not apply to coarse aggregate manufactured from blast-furnace slag unless contamination is evident.</p> <p>d. Clay ironstone is defined as an impure variety of iron carbonate, iron oxide, hydrous iron oxide, or combinations thereof, commonly mixed with clay, silt, or sand. It commonly occurs as dull, earthy particles, homogeneous concretionary masses, or hard-shell particles with soft interiors. Other names commonly used for clay ironstone are "chocolate bars" and limonite concretions.</p> <p>e. Chert is defined as a rock composed of quartz, chalcedony or opal, or any mixture of these forms of silica. It is variable in color. The texture is so fine that the individual mineral grains are too small to be distinguished by the unaided eye. Its hardness is such that it scratches glass but is not scratched by a knife blade. It may contain impurities such as clay, carbonates, iron oxides, and other minerals. Other names commonly applied to varieties of chert are: flint, jasper, agate, onyx, hornstone, porcellanite, novaculite, sard, carnelian, plasma, bloodstone, touchstone, chrysoprase, heliotrope, and petrified wood. Cherty stone is defined as any type of rock (generally limestone) that contains chert as lenses and nodules, or irregular masses partially or completely replacing the original stone.</p> <p>f. Claystone, mudstone, or siltstone, is defined as a massive fine-grained sedimentary rock that consists predominantly of indurated clay or silt without laminations or fissility. It may</p>	

be indurated either by compaction or by cementation.

- g. Shaly limestone is defined as limestone in which shale occurs as one or more thin beds or laminae. These laminae may be regular or very irregular and may be spaced from a few inches down to minute fractions of an inch. Argillaceous limestone is defined as a limestone in which clay minerals occur disseminated in the stone in the amount of 10 to 50 percent by weight of the rock; when these make up from 50 to 90 percent, the rock is known as calcareous (or dolomitic) shale (or claystone, mudstone, or siltstone).

2.2.2.6 Testing Sequence Deleterious Materials -- Airfields Only

The size of the sample shall be at least 200 pounds for the 3/4 to 1-1/2 inch size and 25 pounds for the No. 4 to 3/4 inch coarse aggregate and 10 pounds for the fine aggregate. The Contractor shall provide facilities for the ready procurement of representative test samples. Samples shall be taken and tested by and at the expense of the Contractor, using appropriate Corps of Engineers laboratory and ASTM test methods. Additional tests and analyses of aggregates at various stages in the processing and handling operations may be made by the Government at the discretion of the Contracting Officer. Such Government testing will not relieve the Contractor of any of its testing responsibilities. The testing procedure on each sample of coarse aggregate for compliance with limits on deleterious materials shall be as follows:

Step 1: Test approximately one-fifth of sample for material finer than the No. 200 sieve.

Step 2: Wash off material finer than No. 200 sieve from the remainder of the sample and recombine the remainder with material retained on the No. 200 sieve from Step 1.

Step 3: Test remaining full sample for clay lumps and friable particles and remove.

Step 4: Test remaining full sample for lightweight particles and remove, and then for chert and/or cherty stone with SSD density of less than 2.40 Mg/cubic meter (Sp. Gr. 2.40) and remove.

Step 5: Test remaining sample for clay-ironstone, shale, claystone, mudstone, siltstone, shaly and/or argillaceous limestone, and remove.

Step 6: Test approximately one-fifth of remaining full sample for other soft particles.

Determination of deleterious materials listed in Steps 4 and 5 shall be performed by an individual specifically trained in petrographic identification. The individual selected to perform the identification of these deleterious materials shall be subject to approval and, at least 10 days before any individual is proposed to commence this type of work, the Contractor shall submit a written r, sum, of the individual's training and experience for approval by the Contracting Officer. The Contractor will not be entitled to any extension of time or additional payment due to any delays caused by the testing, evaluation, or personnel requirements.

2.2.2.7 Resistance to Freezing and Thawing

Coarse aggregate not having a satisfactory demonstrable service record shall have a durability factor of 50 or more when subjected to freezing and thawing in concrete in accordance with COE CRD-C 114.

2.2.2.8 Resistance to Abrasion

Coarse aggregate shall not show more than 40 percent loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131.

2.2.2.9 Deleterious Material-Road Pavements

The amount of deleterious material in each sieve size of coarse aggregate shall not exceed the limits in the following table when tested as indicated.

LIMITS OF DELETERIOUS MATERIALS IN COARSE
AGGREGATE FOR ROAD PAVEMENTS
Percentage by Mass

Clay lumps and friable particles (ASTM C 142)	2.0
Material finer than 0.075 mm (No. 200 sieve) (ASTM C 117)	1.0
Lightweight particles (ASTM C 123)	1.0
Other soft particles (ASTM C 330)	2.0

The total of all deleterious substances shall not exceed 5.0 percent of the mass of the aggregate. The percentage of material finer than the No. 200 sieve shall not be included in this total. The limit for material finer than the No. 200 sieve will be increased to 1.5 percent for crushed aggregates consisting of crusher dust that is essentially free from clay or shale. The separation medium for lightweight particles shall have a density of 2.0 Mg/cubic meter (Sp. Gr. 2.0). This limit does not apply to coarse aggregate manufactured from blast-furnace slag unless contamination is evident.

2.2.3 Fine Aggregate

Fine aggregate shall have a service record of at least 5 years satisfactory service in three paving projects or, if a new source is used, shall meet the requirements for resistance to freezing and thawing.

2.2.3.1 Composition

Fine aggregate shall consist of natural sand, manufactured sand, or a combination of the two, and shall be composed of clean, hard, durable particles. Irrespective of the source from which it is obtained, all fine aggregate shall be composed of clean, hard, durable particles meeting the requirements of ASTM C 33. Each type of fine aggregate shall be stockpiled and batched separately. Any degree of contamination will be cause for the rejection of the entire stockpile.

2.2.3.2 Particle Shape

Particles of the fine aggregate shall be generally spherical or cubical in

shape.

2.2.3.3 Grading

Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C 33. In addition, the fine aggregate, as delivered to the mixer, shall have a fineness modulus of not less than 2.50 nor more than 3.00. The grading of the fine aggregate also shall be controlled so that the fineness moduli of at least nine of every set of ten consecutive samples of the fine aggregate, as delivered to the mixer, will not vary more than 0.15 from the average fineness moduli of all samples previously taken. The fineness modulus shall be determined by COE CRD-C 104.

2.2.3.4 Deleterious Material

The amount of deleterious material in the fine aggregate shall not exceed the following limits by mass:

Material	Percentage by Mass
Clay lumps and friable particles ASTM C 142	1.0
Material finer than 0.075 mm (No. 200 sieve) ASTM C 117	3.0
Lightweight particles ASTM C 123 using a medium with a density of 2.0 Mg/cubic meter (Sp. Gr. of 2.0))	0.5
Total of all above	3.0

2.2.3.5 Resistance to Freezing and Thawing

Fine aggregate not having a satisfactory demonstrable service record shall have a durability factor of 50 or more when subjected to freezing and thawing in concrete in accordance with COE CRD-C 114.

2.3 CHEMICAL ADMIXTURES

2.3.1 Air-Entraining Admixtures

The air-entraining admixture shall conform to ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entraining admixture shall be in a solution of suitable concentration for field use.

2.3.2 Accelerator

An accelerator shall be used only when specified in paragraph SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES and shall not be used to reduce the amount of cementitious material used. Accelerator shall conform to ASTM C 494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

2.3.3 Retarder

A retarding admixture shall meet the requirements of ASTM C 494, Type B, except that the 6-month and 1-year compressive strength tests are waived. The use of the admixture is at the option of the Contractor, but shall not be used to reduce the amount of cementitious material.

2.3.4 Water-Reducer

A water-reducing admixture shall meet the requirements of ASTM C 494, Type A or D except that the 6-month and 1-year compressive strength tests are waived. The admixture may be added to the concrete mixture only when its use is approved or directed, and only when it has been used in mixture proportioning studies to arrive at approved mixture proportions.

2.4 CURING MATERIALS

2.4.1 Membrane Forming Curing Compound

Membrane forming curing compound shall be a white pigmented compound conforming to COE CRD-C 300.

2.4.2 Burlap

Burlap used for curing shall conform to AASHTO M 182, Class 3 or 4. Materials shall be new or shall be clean materials never used for anything other than curing concrete.

2.4.3 Impervious Sheet Materials

Impervious sheet materials shall conform to ASTM C 171, type optional, except polyethylene sheet shall be white opaque.

2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 JOINT MATERIALS

2.6.1 Expansion Joint Material

Expansion joint filler shall be a preformed material conforming to ASTM D 1751 or as indicated on the drawings. Expansion joint filler shall be 3/4 inch thick.

2.6.2 Slip Joint Material

Slip joint material shall be 1/4 inch thick expansion joint filler conforming to ASTM D 1751 or ASTM D 1752.

2.6.3 Contraction Joint Inserts

Sawable contraction joint inserts shall conform to COE CRD-C 540. Nonsawable contraction joint inserts shall have sufficient stiffness to permit placement in plastic concrete without deviation from a straight line and shall conform to the physical requirements of COE CRD-C 540, with the exception of Section 4.4, "Resistance to Sawing." Material for polyvinyl chloride inserts shall conform to COE CRD-C 572. Metal inserts shall not be used.

2.7 REINFORCING

All reinforcement shall be free from loose, flaky rust, loose scale, oil,

grease, mud, or other coatings that might reduce the bond with concrete. Removal of thin powdery rust and tight rust is not required. However, reinforcing steel which is rusted to the extent that it does not conform to the required dimensions or mechanical properties shall not be used.

2.7.1 Reinforcing Bars and Bar Mats

Reinforcing bars shall conform to ASTM A 615, billet-steel, Grade 60. Bar mats shall conform to ASTM A 184. The bar members shall be billet steel.

2.7.2 Welded Wire Fabric

Welded steel wire fabric shall conform to ASTM A 185.

2.7.3 Deformed Wire Fabric

Welded deformed steel wire fabric shall conform to ASTM A 497.

2.8 DOWELS AND TIE BARS

2.8.1 Dowels

Dowels shall be single piece bars fabricated or cut to length at the shop or mill before delivery to the site. Dowels shall be free of loose, flaky rust and loose scale and shall be clean and straight. Dowels may be sheared to length provided that the deformation from true shape caused by shearing does not exceed 0.04 inch on the diameter of the dowel and does not extend more than 0.04 inch from the end of the dowel. Dowels shall be plain (non-deformed) steel bars conforming to ASTM A 615, Grade 40 or 60; ASTM A 616, Grade 50 or 60; or ASTM A 617, Grade 40 or 60; or shall be steel pipe conforming to ASTM A 53, extra strong, as indicated. If split dowels are proposed for use, a complete description of the materials and installation procedures shall be submitted for approval at least 15 days before start of construction. Paint for dowels shall conform to MIL-DTL-24441/20.

2.8.2 Tie Bars

Tie bars shall be deformed steel bars conforming to ASTM A 615, ASTM A 616, or ASTM A 617, Grade 60, and of the sizes and dimensions indicated. Deformed rail steel bars and high-strength billet or axle steel bars, Grade 60 or higher, shall not be used for bars that are bent and straightened during construction.

2.9 EPOXY RESIN

All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C 881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

- a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.
- b. Material for use as patching materials for complete filling of spalls, wide cracks, and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.
- c. Material for use for injecting cracks shall be Type IV, Grade 1.

- d. Material for bonding freshly mixed portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

2.10 SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES

2.10.1 Specified Flexural Strength

Specified flexural strength, R, for concrete is 700psi at 90 days, as determined by tests made in accordance with ASTM C 78 of beams fabricated and cured in accordance with ASTM C 192 or as determined by equivalent flexural strength for acceptance as specified in paragraph, Flexural Strength. Maximum allowable water-cementitious material ratio is 0.45. The water-cementitious material ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus pozzolan, and silica fume by the mass equivalency method described in ACI 211.1. The concrete shall be air-entrained with a total air content of 5 plus or minus 1.5 percentage points, at the point of placement. Air content shall be determined in accordance with ASTM C 231. The maximum allowable slump of the concrete at the point of placement shall be 2 inches for pavement constructed with fixed forms. For slipformed pavement, at the start of the project, the Contractor shall select a maximum allowable slump which will produce in-place pavement meeting the specified tolerances for control of edge slump.

2.10.2 Concrete Temperature

The temperature of the concrete as delivered shall conform to the requirements of paragraphs, Paving in Hot Weather and Paving in Cold Weather. Temperature of concrete shall be determined in accordance with ASTM C 1064.

2.10.3 Concrete Strength for Final Acceptance

The strength of the concrete will be considered acceptable when the average equivalent 28-day Flexural strengths (650 psi) for each lot are above the 'Specified Flexural Strength' as determined by correlation with 14-day compressive strength tests specified in paragraph MIXTURE PROPORTIONS BY CONTRACTOR for 28-day flexural Strength, and no individual set (2 cylinders per subplot) in the lot are 25 psi or more below the equivalent 'Specified Flexural Strength'. If any lot or subplot, respectively, fails to meet the above criteria, the lot or subplot shall be removed and replaced at no additional cost to the Government. This is in addition to and does not replace the average strength required for day-to-day CQC operations as specified in paragraph Average Flexural Strength Required for Mixtures.

2.11 MIXTURE PROPORTIONS BY CONTRACTOR

2.11.1 Composition

Concrete shall be composed of cementitious material, water, fine and coarse aggregates, and admixtures. The cementitious material shall be portland cement; or only portland cement in combination with silica fume. Pozzolan, if used, shall consist of not less than 15 percent of the cementitious material by mass and not more than 35 percent. The total cementitious material content shall be at least 517 lb./cu. yd. Admixtures shall consist of air entraining admixture and may also include, as approved accelerator retarder or water-reducing admixture. If water-reducer is

used, it shall be used only at the dosage determined during mixture proportioning studies. High range water-reducing admixtures and admixtures to produce flowable concrete shall not be used.

2.11.2 Concrete Proportioning Studies, Pavement Concrete

Trial design batches, mixture proportioning studies, and testing requirements shall be the responsibility of the Contractor. Mixture proportioning studies shall be performed by a commercial laboratory, inspected by the Government, and approved in writing. The laboratory performing the mixture proportioning shall conform with ASTM C 1077. Strength requirements during mixture proportioning studies shall be based on flexural strength as determined by test specimens fabricated in accordance with ASTM C 192 and tested in accordance with ASTM C 78. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use on the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in ACI 211.1, modified as necessary to accommodate flexural strength.

2.11.2.1 Water-Cement Ratio

At least three different water-cement ratios, which will produce a range of strength encompassing that required on the project, shall be used. The maximum allowable water-cement ratio required in paragraph Maximum Water-Cement Ratio will be the equivalent water-cement ratio as determined by conversion from the mass ratio of water to cement plus pozzolan, silica fume by the weight equivalency method as described in ACI 211.1. In the case where silica fume is used, the mass of the silica fume shall be included in the equations in ACI 211.1 for the term P, which is used to denote the mass of pozzolan. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent by mass of the total cementitious material and the maximum shall be 35 percent. Laboratory trial mixtures shall be proportioned for maximum permitted slump and air content.

2.11.2.2 Trial Mixture Studies

Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any placing method proposed which requires special properties.

The temperature of concrete in each trial batch shall be reported. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding. Concrete proportioning studies shall be performed using the following procedures:

2.11.2.3 Mixture Proportioning for 90-day Flexural Strength

The following step by step procedure shall be followed:

- a. Fabricate all beams and cylinders for each mixture from the same batch or blend of batches. Fabricate and cure all beams and

cylinders in accordance with ASTM C 192, using 6 x 6 inch beams and 6 x 12 inch cylinders.

- b. Test beams in accordance with ASTM C 78, cylinders in accordance with ASTM C 39.
- c. Fabricate and cure test beams from each mixture for 7, 14, and 28-day flexural tests; 6 beams to be tested per age.
- d. Fabricate and cure test cylinders from each mixture for 7, 14, 28-day compressive strength tests; 6 cylinders to be tested per age.
- e. Using the average strength for each w/c at each age, plot all results from each of the three mixtures on separate graphs for w/c versus:
 - 7-day flexural strength
 - 14-day flexural strength
 - 28-day flexural strength
 - 7-day compressive strength
 - 14-day compressive strength
 - 28-day compressive strength
- f. From these graphs select a w/c that will produce a mixture giving a 90-day flexural strength equal to the required strength determined in accordance with paragraph "Average Flexural Strength Required for Mixtures".
- g. Using the above selected w/c, select from the graphs the expected 7, 14, and 28-day flexural strengths and the expected 7, 14, and 28-day compressive strengths for the mixture.
- h. From the above expected strengths for the selected mixture determine the following Correlation Ratios:
 - (1) Ratio of the 14-day compressive strength of the selected mixture to the 28-day flexural strength of the mixture (for acceptance).
 - (2) Ratio of the 7-day compressive strength of the selected mixture to the 28-day flexural strength of the mixture (for CQC control).
- i. If there is a change in materials, additional mixture design studies shall be made using the new materials and new Correlation Ratios shall be determined.
- j. No concrete pavement shall be placed until the Contracting Officer has approved the Contractor's mixture proportions.

2.11.3 Contractor Quality Control for Average Flexural Strength

The Contractor's day to day production shall be Controlled (CQC) in accordance with the criteria herein, in the following subparagraphs, and in par. 'Concrete Strength Testing for CQC'. This is entirely different from the acceptance requirements of par. 'Concrete Strength for Final Acceptance', and it is mandatory that both sets of requirements must be met. If at any time, the 'equivalent average 28-day flexural strength',

for any lot, as determined by correlation with results of 7-day compressive test specimens, is 69 psi or more below the 'required equivalent average 28-day flexural strength', as specified below, the paving operation shall be stopped and the Contractor shall take necessary steps to improve the mixture proportioning, materials, or the batching and mixing to increase the strength. The paving operations shall not recommence until the Contracting Officer has approved the Contractor's Proposed changes in writing.

2.11.3.1 Average CQC Flexural Strength Required for Mixtures

In order to ensure meeting, the strength requirements specified in paragraph SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES, during production, the mixture proportions selected during mixture proportioning studies and used during construction shall produce a required average CQC flexural strength exceeding the specified strength, R, by the amount indicated below. This required average CQC flexural strength, Ra, will be used only for CQC operations as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL and as specified in the previous paragraph. During production, the required Ra shall be adjusted (increased or decreased), as appropriate and as approved, based on the standard deviation of equivalent 90-day strengths being attained during paving.

- a. From Previous Test Records: Where a concrete production facility has previous test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected, shall represent concrete produced to meet a specified flexural strength or strengths within 150 psi of the 28-day flexural strength specified for the proposed work, and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two specimens made from the same sample of concrete and tested at 28 days. Required average CQC flexural strength, Ra, used as the basis for selection of concrete proportions shall be the value from the equation that follows, using the standard deviation as determined above:

$$Ra = R + 1.34S$$

Where: S = standard deviation

R = specified flexural strength

Ra = required average flexural strength

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS	MODIFICATION FACTOR FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

NUMBER OF TESTS

MODIFICATION FACTOR
FOR STANDARD DEVIATION

- b. Without Previous Test Records: When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength, R_a , shall be determined by adding 15 percent to the specified flexural strength, R .

PART 3 EXECUTION

3.1 PREPARATION FOR PAVING

Before commencing paving, the following shall be performed. Surfaces to receive concrete shall be prepared as specified below. If used, forms shall be in place, cleaned, coated, and adequately supported. Any reinforcing steel needed shall be at the paving site. All transporting and transfer equipment shall be ready for use, clean, and free of hardened concrete and foreign material. Equipment for spreading, consolidating, screeding, finishing, and texturing concrete shall be at the paving site, clean and in proper working order. All equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the paving site, in proper working condition, and in sufficient amount for the entire placement. When hot, windy conditions during paving appear probable, equipment and material shall be at the paving site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.2 CONDITIONING OF UNDERLYING MATERIAL

3.2.1 General Procedures

Underlying material, base course, upon which concrete is to be placed shall be clean, damp, and free from debris, waste concrete or cement, frost, ice, and standing or running water. Prior to setting forms or placement of concrete, the underlying material shall be well drained and shall have been satisfactorily graded and uniformly compacted in accordance with the applicable Section of these specifications. The surface of the base course shall be tested as to crown, elevation, and density in advance of setting forms or of concrete placement using slip-form techniques. High areas shall be trimmed to proper elevation. Low areas shall be filled and compacted to a condition similar to that of surrounding grade, or filled with concrete monolithically with the pavement. Where low areas are filled with concrete, the areas shall be marked, as approved, and cores for thickness determinations as required by paragraph, Flexural Strength and Thickness shall not be drilled in those areas. Any underlying material disturbed by construction operations shall be reworked and recompact to specified density immediately in front of the paver. If a slipform paver is permitted and is used, the same underlying material under the paving lane shall be continued beyond the edge of the lane a sufficient distance and shall be thoroughly compacted and true to grade to provide a suitable trackline for the slipform paver and firm support for the edge of the paving lane. Where an open-graded granular base is required under the concrete, the Contractor shall select paving equipment and procedures which will operate properly on the base course without causing displacement or other damage.

3.2.2 Traffic on Underlying Material

After the underlying material has been prepared for concrete placement, no equipment shall be permitted thereon. Subject to specific approval, crossing of the prepared subgrade or base course at specified intervals for construction purposes may be permitted, provided rutting or indentations do not occur; however, if traffic has been allowed to use the prepared subgrade or base course, the surface shall be reworked and repared to the satisfaction of the Contracting Officer before concrete is placed.

3.3 WEATHER LIMITATIONS

3.3.1 Placement and Protection During Inclement Weather

The Contractor shall not commence placing operations when heavy rain or other damaging weather conditions appear imminent. At all times when placing concrete, the Contractor shall maintain on-site sufficient waterproof cover and means to rapidly place it over all unhardened concrete or concrete that might be damaged by rain. Placement of concrete shall be suspended whenever rain or other damaging weather commences to damage the surface or texture of the placed unhardened concrete, washes cement out of the concrete, or changes the water content of the surface concrete. All unhardened concrete shall be immediately covered and protected from the rain or other damaging weather. Any pavement damaged by rain or other weather shall be completely removed and replaced at the Contractor's expense as specified in paragraph, Repair, Removal, Replacement of Slabs.

3.3.2 Paving in Hot Weather

When the ambient temperature during paving is expected to exceed 90 degrees F, the concrete shall be properly placed and finished in accordance with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064. Cooling of the mixing water or aggregates or placing in the cooler part of the day may be required to obtain an adequate placing temperature. An approved retarder may be used to facilitate placing and finishing. Steel forms and reinforcing shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Transporting and placing equipment shall be cooled or protected if necessary to maintain proper concrete-placing temperature. Concrete shall be placed continuously and rapidly at a rate of not less than 100 feet of paving lane per hour. The finished surfaces of the newly laid pavement shall be kept damp by applying a fog spray (mist) with approved spraying equipment until the pavement is covered by the curing medium. If necessary, wind screens shall be provided to protect the concrete from an evaporation rate in excess of 0.2 lb./square foot per hour, as determined by method shown in Figure 2.1.5 of ACI 305R.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature in Degrees F
Greater than 60	90
40-60	85
Less than 40	80

3.3.3 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, the Contractor shall develop and institute measures to prevent plastic shrinkage cracks from developing. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition to the protective measures specified in the previous paragraph, the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding, or wet covering. When such water treatment is stopped, curing procedures shall be immediately commenced. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

3.3.4 Paving in Cold Weather

Special protection measures, as submitted and approved, and as specified herein, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air at the placing site and the temperature of surfaces to receive concrete shall be not less 40 degrees F. However, placement may begin when both the ambient temperature and the temperature of the underlying material are at least 35 degrees F and rising. When the ambient temperature is less than 50 degrees F, the temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Calcium chloride shall not be used at any time. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period. Pavement damaged by freezing shall be completely removed and replaced at the Contractor's expense as specified in paragraph REPAIR, REMOVAL, REPLACEMENT OF SLABS.

3.4 CONCRETE PRODUCTION

Batching, mixing, and transporting equipment shall have a capacity sufficient to maintain a continuous, uniform forward movement of the paver of not less than 2.5 feet per minute. Concrete shall be deposited in front of the paver within 45 minutes from the time cement has been charged into the mixing drum, except that if the ambient temperature is above 90 degrees F, the time shall be reduced to 30 minutes. No water shall be added to the concrete after it is batched. Every load of concrete delivered to the paving site shall be accompanied by a batch ticket from the operator of the batching plant. Tickets shall be on approved forms and shall show at least the mass, or volume, of all ingredients in each batch delivered, and the time of day. Tickets shall be delivered to the placing foreman who shall keep them on file and deliver them to the Government weekly.

3.4.1 Batching and Mixing Concrete

The batching and mixing equipment and the operation thereof shall conform to the requirements of paragraph EQUIPMENT and as specified herein. All equipment shall be kept clean and in operable condition at all times.

Scale pivots and bearings shall be kept clean and free of rust. Any equipment which fails to perform as specified shall immediately be removed from use until properly repaired and adjusted, or replaced.

3.4.2 Transporting and Transfer - Spreading Operations

The transporting and transfer equipment and the operation thereof shall conform to the requirements of paragraph EQUIPMENT and as specified herein.

All equipment shall be kept clean and in operable condition at all times. Non-agitating equipment shall be used only on smooth roads and for haul time less than 15 minutes at all times during the work day. No transporting equipment shall be allowed to operate on the prepared and compacted underlying material in front of the paver-finisher. Equipment shall be allowed to operate on the underlying material only if approved in writing and only if no damage is done to the underlying material and its degree of compaction. Any disturbance to the underlying material that does occur shall be corrected, as approved, before the paver-finisher or the deposited concrete reaches the location of the disturbance and the equipment shall be replaced or procedures changed to prevent any future damage. An approved transfer spreader shall be used to transfer the concrete from hauling equipment outside the paving lane and to spread it evenly and strike it off to approximate grade in front of the paver-finisher. A travelling surge hopper shall be used to accept the concrete from the transporting equipment, store it as necessary, and feed it evenly across the paving lane at a depth which permits the paver to operate efficiently and at a rate that permits the paver to have a continuous forward movement. Concrete shall be deposited as close as possible to its final position in the paving lane. All equipment shall be operated to discharge and transfer concrete without segregation. In no case shall dumping of concrete in discrete piles be permitted. No transfer or spreading operation which requires the use of front-end loaders, dozers, or similar equipment to distribute the concrete will be permitted. All batching and mixing, transporting, transferring, paving, and finishing shall be properly coordinated and controlled such that the paver-finisher has a continuous forward movement at a reasonably uniform speed from beginning to end of each paving lane, except for inadvertent equipment breakdown. Failure to achieve this shall require the Contractor to halt operations, regroup, and modify operations to achieve this requirement.

3.5 PAVING

3.5.1 General Requirements

The paving and finishing equipment and the operation thereof shall conform to the requirements of paragraph EQUIPMENT and as specified herein. All equipment shall be kept clean and properly operable at all times. Pavement shall be constructed with paving and finishing equipment utilizing rigid fixed forms [or by use of slipform paving equipment]. Paving and finishing equipment and procedures shall be capable of constructing paving lanes of the required width at a rate of at least 100 feet of paving lane per hour on a routine basis. Paving equipment and its operation shall be controlled, and coordinated with all other operations, such that the paver-finisher has a continuous forward movement, at a reasonably uniform speed, from beginning to end of each paving lane, except for inadvertent equipment breakdown. Workmen with foreign material on their footwear or construction equipment that might deposit foreign material shall not be permitted to walk or operate in the plastic concrete.

3.5.2 Consolidation

Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. Gang-mounted vibrator spuds shall be spaced so as to thoroughly consolidate the entire paving lane, but not more than 30 inch spacing, and with the outside vibrators not more than 12 inches from the edge of the lane. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches. The vibrators or any tamping units in front of the paver shall be automatically controlled so that they shall be stopped immediately as forward motion ceases. Excessive vibration shall not be permitted. If the vibrators cause visible tracking in the paving lane, the paving operation shall be stopped and equipment and operations modified to prevent it. Concrete in small, odd-shaped slabs or in isolated locations inaccessible to the gang-mounted vibration equipment shall be vibrated with an approved hand-operated immersion vibrator. Vibrators shall not be used to transport or spread the concrete. Hand-operated vibrators shall not be operated in the concrete at one location for more than 20 seconds. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) shall require the immediate stopping of the paving operation and approved adjustment of the equipment or procedures.

3.5.3 Operation

When the paver approaches a header at the end of a paving lane, a sufficient amount of concrete shall be maintained ahead of the paver to provide a roll of concrete which will spill over the header. The amount of extra concrete shall be sufficient to prevent any slurry that is formed and carried along ahead of the paver from being deposited adjacent to the header. The spud vibrators in front of the paver shall be brought as close to the header as possible before they are lifted. Additional consolidation shall be provided adjacent to the headers by hand-manipulated vibrators. When the paver is operated between or adjacent to previously constructed pavement (fill-in lanes), provisions shall be made to prevent damage to the previously constructed pavement. Transversely oscillating screeds and extrusion plates shall overlap the existing pavement the minimum possible, but in no case more than 8 inches. These screeds or extrusion plates shall be electronically controlled from the previously placed pavement so as to prevent them from applying pressure to the existing pavement and to prevent abrasion of the pavement surface. The overlapping area of existing pavement surface shall at all times be kept completely free of any loose or bonded foreign material as the paver-finisher operates across it. When the paver travels on existing pavement, approved provisions shall be made to prevent damage to the existing pavement. Pavers using transversely oscillating screeds shall not be used to form fill-in lanes that have widths less than a full width for which the paver was designed or adjusted.

3.5.4 Required Results

The paver-finisher, and its gang-mounted vibrators, together with its operating procedures shall be adjusted and operated and coordinated with the concrete mixture being used to produce a thoroughly consolidated slab throughout, true to line and grade within specified tolerances. The screed or the extrusion plate shall be properly adjusted to produce a pavement surface true to line and grade. Any necessary adjustment to compensate for

surging behind the screed or for inadequate height of surface after paving shall be carefully made and checked frequently. The paver-finishing operation shall produce a surface finish free of irregularities, tears, voids of any kind, and any other discontinuities. It shall produce only a very minimum of paste at the surface; never more than 3/32 inch cover over the top layer of coarse aggregate. The paver-finisher shall make only one pass across the pavement; multiple passes will not be permitted. The equipment and its operation shall produce a finished surface requiring no hand finishing other than the use of cutting straightedges, except in very infrequent instances. If any equipment or operation fails to produce the above results, the paving shall be stopped, the equipment shall be replaced or properly adjusted, the operation shall be appropriately modified, or the mixture proportions modified, in order to produce the required results before recommencing paving. No water, other than true fog sprays (mist) as specified in paragraph, Prevention of Plastic Shrinkage Cracking, shall be applied to the concrete or the concrete surface during paving and finishing.

3.5.5 Fixed Form Paving

Paving equipment for fixed-form paving and the operation thereof shall conform to the requirements of paragraph EQUIPMENT, all requirements specified above under paragraph PAVING and as specified herein.

3.5.5.1 Forms for Fixed-Form Paving

- a. Forms shall be steel, except that wood forms may be used for curves having a radius of 150 feet or less, and for fillets. Forms shall be equal in depth to the edge thickness of the slab as shown on the drawings. Forms shall be in one piece for the full depth required, except as permitted below. Under no conditions shall forms be adjusted by filling or excavating under the forms to an elevation other than the bottom of the pavement slab. Where the project requires several different slab thicknesses, forms may be built up with metal or wood to provide an increase in depth of not more than 25 percent. The required form depth may be obtained by securely bolting or welding to the bottom of the form a tubular metal section of the proper thickness or by securely bolting wood planks to the bottom of the form. The tubular metal section or wood planks shall completely cover the underside of the base of the form and shall extend beyond the edge of the base a sufficient distance to provide the necessary stability. The base width of the one-piece form, or built-up form, shall be not less than eight-tenths of the vertical height of the form, except that forms 8 inches or less in vertical height shall have a base width not less than the vertical height of the form. Forms shall not be built-up by adding to the top. The top surface of each form section shall not vary more than 1/16 inch in 12 feet from a true line. The face of the form shall not vary more than 3/16 inch in 12 feet from a true plane. Forms with battered top surfaces or distorted faces or bases shall be removed from the project. Where keyway forms are required, they shall be rigidly attached to the main form so no displacement can take place. Metal keyway forms shall be tack-welded to steel forms. Keyway forms shall be so aligned that there is no variation over 1/4 inch either vertically or horizontally, when tested with a 12 foot template after forms are set, including tests across form joints.
- b. Steel forms shall be furnished in sections not less than 10 feet in length, except that on curves having a radius of 150 feet or

less, the length of the sections shall be 5 feet unless the sections are flexible or curved to the proper radius. Each 10 foot length of form shall be provided with at least three form braces and pin sockets so spaced that the form will be rigidly braced throughout its length. Lock joints between form sections shall be free from play or movement. Forms shall be free of warps, bends, or kinks.

- c. Wood forms for curves and fillets shall be made of well-seasoned, surfaced plank or plywood, straight, and free from warp or bend. Wood forms shall be adequate in strength and rigidly braced.
- d. The forms shall be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire length and base width. Underlying material shall be thoroughly compacted and trimmed to grade before forms are set in place. Setting forms on blocks or on built-up spots of underlying material will be not permitted under any condition. The form sections shall be staked into position and tightly locked together. The length of pins and quantity provided in each section shall be sufficient to hold the form at the correct line and grade. When tested with a straightedge, the top of the installed form shall conform to the requirements specified for the finished surface of the concrete, and the longitudinal axis of the upstanding leg shall not vary more than 1/4 inch from the straightedge. Conformity to the alignment and grade elevations shown on the drawings shall be checked and necessary corrections shall be made immediately prior to placing the concrete. Forms shall be set well in advance of concrete placement. The forms shall be cleaned and oiled each time before concrete is placed. No concrete shall be placed until setting of forms has been checked and approved by the CQC team.
- e. Forms for overlay and in fill pavements and for other locations where forms must be set on existing pavements shall be held securely in place with stakes or by other approved methods. Holes in existing pavements for form stakes shall be carefully drilled by methods which will not crack or spall the existing pavement. After use, the holes shall be filled as directed. Any method which does not hold the form securely or which damages the existing pavement shall be immediately discontinued. Prior to setting forms for paving operations, the Contractor shall demonstrate his proposed form setting procedures at an approved location and shall not proceed further until the proposed method is approved.

3.5.5.2 Form Removal

Forms shall remain in place at least 12 hours after the concrete has been placed. When conditions are such that the early strength gain of the concrete is delayed, the forms shall be left in place for a longer time, as directed. Forms shall be removed by procedures that do not injure the concrete. Bars or heavy metal tools shall not be used directly against the concrete in removing the forms. Any concrete found to be defective after form removal shall be repaired promptly, using procedures specified hereinafter or as directed.

3.5.6 Slipform Paving

3.5.6.1 General

Paving equipment for slipform paving and the operation thereof shall conform to the requirement of paragraph EQUIPMENT, all requirements specified above in subparagraphs, General, Consolidation, Operation, and Required Results, and as specified herein. The slipform paver shall shape the concrete to the specified and indicated cross section, meeting all tolerances, in one pass. The slipform paver shall finish the surface and edges so that only a very minimum isolated amount of hand finishing is required. If the paving operation does not meet the above requirements and the specified tolerances, the operation shall be immediately stopped, and the Contractor shall regroup and replace or modify any equipment as necessary, modify paving procedures or modify the concrete mix, in order to resolve the problem. The slipform paver shall be automatically electronically controlled from a taut wire guideline for horizontal alignment and on both sides from a taut wire guideline for vertical alignment, except that electronic control from a ski operating on a previously constructed adjoining lane shall be used where applicable for either or both sides. Automatic, electronic controls for vertical alignment shall always be used on both sides of the lane. Control from a slope-adjustment control or control operating from the underlying material shall never be used. If approved by the Contracting Officer after a preconstruction demonstration, automatic laser controls may be used in lieu of or to supplement the taut wire guidelines. Side forms on slipform pavers shall be properly adjusted so that the finished edge of the paving lane meets all specified tolerances. Dowels in longitudinal construction joints shall be installed as specified below. The installation of these dowels by dowel inserters attached to the paver or by any other means of inserting the dowels into the plastic concrete shall not be permitted.

3.5.6.2 Guideline for Slipform Paving

Guidelines shall be accurately and securely installed well in advance of concrete placement. Supports shall be provided at necessary intervals to eliminate all sag in the guideline when properly tightened. The guideline shall be high strength wire set with sufficient tension to remove all sag between supports. Supports shall be securely staked to the underlying material or other provisions made to ensure that the supports will not be displaced when the guideline is tightened or when the guideline or supports are accidentally touched by workmen or equipment during construction. The appliances for attaching the guideline to the supports shall be capable of easy adjustment in both the horizontal and vertical directions. When it is necessary to leave gaps in the guideline to permit equipment to use or cross underlying material, provisions shall be made for quickly and accurately replacing the guideline without any delay to the forward progress of the paver. Supports on either side of the gap shall be secured in such a manner as to avoid disturbing the remainder of the guideline when the portion across the gap is positioned and tightened. The guideline across the gap and adjacent to the gap for a distance of 200 feet shall be checked for horizontal and vertical alignment after the guideline across the gap is tightened. Vertical and horizontal positioning of the guideline shall be such that the finished pavement shall conform to the alignment and grade elevations shown on the drawings within the specified tolerances for grade and smoothness. The specified tolerances are intended to cover only the normal deviations in the finished pavement that may occur under good supervision and do not apply to setting of the guideline. The guideline shall be set true to line and grade.

3.5.6.3 Laser Controls

If the Contractor proposes to use any type of automatic laser controls, a detailed description of the system shall be submitted and a trial field demonstration shall be performed in the presence of the Contracting Officer at least one week prior to start of paving. Approval of the control system will be based on the results of the demonstration and on continuing satisfactory operation during paving.

3.5.7 Placing Reinforcing Steel

The type and amount of steel reinforcement shall be as shown on the drawings. For pavement thickness of 12 inches or more, the reinforcement steel shall be installed by the strike-off method wherein a layer of concrete is deposited on the underlying material, consolidated, and struck to the indicated elevation of the steel reinforcement. The reinforcement shall be laid upon the prestruck surface, and the remaining concrete shall then be placed and finished in the required manner. When placement of the second lift causes the steel to be displaced horizontally from its original position, provisions shall be made for increasing the thickness of the first lift and depressing the reinforcement into the unhardened concrete to the required elevation. The increase in thickness shall be only as necessary to permit correct horizontal alignment to be maintained. Any portions of the bottom layer of concrete that have been placed more than 30 minutes without being covered with the top layer shall be removed and replaced with newly mixed concrete without additional cost to the Government. For pavements less than 12 inches thick, the reinforcement shall be positioned on suitable chairs securely fastened to the subgrade prior to concrete placement. Concrete shall be vibrated after the steel has been placed. Regardless of placement procedure, the reinforcing steel shall be free from coatings which could impair bond between the steel and concrete, and laps in the reinforcement shall be as indicated. In lieu of the above, automatic reinforcement depressing attachments may be used to position the reinforcement, either bar mats or welded wire fabric, provided the entire operation is approved by the Contracting Officer. Regardless of the equipment or procedures used for installing reinforcement, the Contractor shall ensure that the entire depth of concrete is adequately consolidated.

3.5.8 Placing Dowels and Tie Bars

The method used in installing and holding dowels in position shall ensure that the error in alignment of any dowel from its required alignment after the pavement has been completed will not be greater than 1/8 in. per ft. Except as otherwise specified below, location of dowels shall be within a horizontal tolerance of plus or minus 5/8 inch. The Contractor shall furnish an approved template for checking the alignment and position of the dowels. The portion of each dowel intended to move within the concrete or expansion cap shall be painted with one coat of the specified paint. When dry, the painted portion shall be wiped clean and coated with a thin, even film of lubricating oil before the concrete is placed. Pipe used as dowels shall be filled with a stiff sand-asphalt mixture or portland-cement mortar. Dowels in joints shall be omitted when the center of the dowel is located within a horizontal distance from an intersecting joint equal to or less than one-fourth of the slab thickness. Dowels shall be installed as specified in the following subparagraphs.

3.5.8.1 Contraction Joints

Dowels in longitudinal and transverse contraction joints within the paving

lane shall be held securely in place, as indicated, by means of rigid metal frames or basket assemblies of an approved type. The assemblies shall consist of a framework of metal bars or wires arranged to provide rigid support for the dowels throughout the paving operation, with a minimum of four continuous bars or wires extending along the joint line. The dowels shall be welded to the assembly or held firmly by mechanical locking arrangements that will prevent them from rising, sliding out, or becoming distorted during paving operations. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. At the Contractor's option, in lieu of the above, dowels in contraction joints shall be installed near the front of the paver by insertion into the plastic concrete using approved equipment and procedures. Approval will be based on the results of a preconstruction demonstration which the Contractor shall conduct, showing that the dowels are installed within specified tolerances.

3.5.8.2 Construction Joints-Fixed Form Paving

Installation of dowels shall be by the bonded-in-place method. Installation by removing and replacing in preformed holes will not be permitted. Dowels shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms. The spacing of dowels in construction joints shall be as indicated, except that, where the planned spacing cannot be maintained because of form length or interference with form braces, closer spacing with additional dowels shall be used.

3.5.8.3 Dowels Installed in Hardened Concrete

Dowels installed in hardened concrete, such as in longitudinal construction joints for slipform paving, in joints between new and existing pavement, and similar locations, shall be installed by bonding the dowels into holes drilled into the hardened concrete. The installation of dowels in longitudinal construction joints by dowel inserters attached to a slipform paver or by any other means of inserting the dowels into the plastic concrete shall not be permitted. However, when paving two lanes together with a longitudinal contraction joint between, any dowels required may be installed in this joint with an approved inserter. Holes approximately 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete with rotary core drills to receive the dowels. In lieu of rotary drills, the contractor may use percussion drills, provided that spalling at the collar of the hole does not occur. Regardless of the type of drill used, the drill shall be held rigidly in exact alignment by means of a stable jig or framework, solidly supported; gang drills meeting this are acceptable. Any damage to the concrete face during drilling shall be repaired as directed; continuing damage shall require modification of the equipment and operation. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel shall not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic collar fitted around the dowel. The vertical alignment of the dowels shall be checked by placing a straightedge on the surface of the pavement over the top of the dowel and measuring the vertical distance between the straightedge and the beginning and ending point of the exposed part of the dowel. The horizontal alignment shall be checked with a framing square. Dowels required to be

installed in any joints between new and existing concrete shall be grouted in holes drilled in the existing concrete, all as specified above.

3.5.8.4 Expansion Joints

Dowels in expansion joints shall be installed as shown using appropriate procedures specified above.

3.6 FINISHING

The finishing machine, or paver-finisher, shall meet all requirements specified in paragraph EQUIPMENT and herein. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver and the machines shall be designed and operated to strike off, screed, and consolidate the concrete. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, texturing, and then edging of joints. Finishing shall be by the machine method. The hand method shall be used only infrequently and only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. When approved, the hand finishing method may also be used for separate, isolated slabs during removal and replacement type repair operations. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Equipment to be used for supplemental hand finishing shall primarily be 10 to 12 feet cutting straightedges; only very sparing use of bull floats shall be allowed. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Every effort shall be made to prevent bringing excess paste to the surface and any operations which produce more than 3/32 inch of paste (mortar, water, laitance, etc.) over the top layer of coarse aggregate shall be halted immediately and the equipment, mixture, or procedures modified as necessary. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Surface checks shall be made regularly and paving operations immediately halted and adjustments made whenever compensation is inadequate. Screed and float adjustments of the machines shall be checked at the start of each day's paving operations and more often if required. Machines that cause frequent delays due to mechanical failure shall be replaced. When machines ride the edge of a previously constructed slab, the edge shall be kept clean and provision shall be made to protect the surface of the slab. Clary screeds, "bridge deck" finishers, or other rotating pipe or tube type equipment will not be permitted. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way, except for fog (mist) sprays specified to prevent plastic shrinkage cracking.

3.6.1 Longitudinal Floating

When the equipment contains a mechanical, longitudinal, oscillating float, the float shall be operated to smooth and finish the pavement immediately behind the transverse screed or extrusion plate. The float shall be operated maintaining contact with the surface at all times. Care shall be taken to prevent working paste to the surface in excess of the amount

specified above.

3.6.2 Other Types of Finishing Equipment

Concrete finishing equipment of types other than those specified above may be used on a trial basis, when specifically approved, except that rotating pipe or tubes or bridge deck finishers will not be permitted. Approval will be given after demonstration on a test section prior to start of construction, and provided the Contracting Officer determines that the pavement produced is better than that produced by the specified equipment. The use of equipment that fails to produce finished concrete of the required quality, using concrete proportions and slump as specified, shall be discontinued, and the concrete shall be finished with specified equipment and in the manner specified above. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved. Slipform paving equipment shall not be operated on fixed forms unless approved in writing prior to use.

3.6.3 Machine Finishing With Fixed Forms

The machine shall be designed to ride the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

3.6.4 Machine Finishing With Slipform Pavers

The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled nonrotating pipe float may be used if the Contractor desires while the concrete is still plastic, to remove minor irregularities and score marks. The pipe float shall be 6 to 10 inches in diameter and sufficiently long to span the full paving width when oriented at an angle of approximately 60 degrees with the center line. Only one pass of the pipe float shall be allowed. If there is sufficient concrete slurry or fluid paste on the surface that it runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens. Slabs having areas of edge slump in excess of the specified tolerances shall be removed and replaced in accordance with paragraph, REPAIR, REMOVAL, REPLACEMENT OF SLABS; repair operations on such areas will not be permitted.

3.6.5 Surface Correction and Testing

After all other finishing is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of cutting straightedges. Such straightedges shall be 12 feet in length and shall be operated from the sides of the pavement

and from bridges. A straightedge operated from the side of the pavement shall be equipped with a handle 3 feet longer than one-half the width of the pavement. The surface shall then be tested for trueness with a straightedge held in successive positions parallel and at right angles to the center line of the pavement, and the whole area covered as necessary to detect variations. The straightedge shall be advanced along the pavement in successive stages of not more than one-half the length of the straightedge. Depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. The straightedge testing and finishing shall continue until the entire surface of the concrete is free from observable departure from the straightedge and conforms to the surface requirements specified in paragraph ACCEPTABILITY OF WORK AND PAYMENT ADJUSTMENTS. Long-handled, flat bull floats shall be used very sparingly and only as necessary to correct minor, scattered surface defects. If frequent use of bull floats is necessary, the paving operation shall be stopped and the equipment, mixture or procedures adjusted to eliminate the surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Extreme care shall be taken to prevent overfinishing joints and edges. The surface finish of the pavement shall be produced essentially by the finishing machine and not by subsequent hand finishing operations. All hand finishing operations shall be subject to approval and shall be modified when directed. No water shall be added to the pavement surface during these operations.

3.6.6 Hand Finishing

Hand finishing operations shall be used only as specified above.

3.6.6.1 Equipment

In addition to approved mechanical internal vibrators for consolidating the concrete, a strike-off and tamping template and a longitudinal float shall be provided for hand finishing. The template shall be at least 1 foot longer than the width of pavement being finished, of an approved design, and sufficiently rigid to retain its shape, and shall be constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 10 feet long, of approved design, and rigid and substantially braced, and shall maintain a plane surface on the bottom. Grate tampers (jitterbugs) shall not be used.

3.6.6.2 Finishing and Floating

As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. In addition to previously specified complete coverage with handheld immersion vibrators, the entire surface shall be tamped with the strike-off and tamping template, and the tamping operation continued until the required compaction and reduction of internal and surface voids are accomplished (grate tampers shall not be used). Immediately following the final tamping of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces. Long-handled, flat bull floats shall be used

very sparingly and only as necessary to correct minor, scattered surface defects. If frequent use of bull floats is necessary, the operation shall be stopped and adjusted to eliminate the surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Extreme care shall be taken to prevent overfinishing joints and edges. No water shall be added to the pavement during finishing operations.

3.6.7 Texturing

Before the surface sheen has disappeared and before the concrete hardens, the surface of the pavement shall be given a texture as described herein. After curing is complete, all textured surfaces shall be thoroughly power broomed to remove all debris.

3.6.7.1 Fabric Drag Surface Finish

Surface texture shall be applied by dragging the surface of the pavement, in the direction of the concrete placement, with an approved fabric drag. The drag shall be operated with the fabric moist, and the fabric shall be cleaned or changed as required to keep clean. The dragging shall be done so as to produce a uniform finished surface having a fine sandy texture without disfiguring marks.

3.6.8 Edging

After texturing has been completed, the edge of the slabs along the forms, along the edges of slipformed lanes, and at the joints shall be carefully finished with an edging tool to form a smooth rounded surface of 1/8 inch radius. Tool marks shall be eliminated, and the edges shall be smooth and true to line. No water shall be added to the surface during edging. Extreme care shall be taken to prevent overworking the concrete.

3.6.9 Outlets in Pavement

Recesses for the tie-down anchors, lighting fixtures, and other outlets in the pavement shall be constructed to conform to the details and dimensions shown. The concrete in these areas shall be carefully finished to provide a surface of the same texture as the surrounding area that will be within the requirements for plan grade and surface smoothness.

3.7 CURING

3.7.1 Protection of Concrete

Concrete shall be continuously protected against loss of moisture and rapid temperature changes for at least 7 days from the completion of finishing operations. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Sufficient sheet material to protect unhardened concrete from rain shall be at the paver at all times. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period. If any selected method of curing does not afford the proper curing and protection against concrete cracking, the damaged pavement shall be removed and replaced, and another method of curing shall be employed as directed. Curing shall be accomplished by one of the following methods except that only moist curing shall be used for the first 24 hours.

3.7.2 Membrane Curing

A uniform coating of white-pigmented, membrane-forming, curing compound shall be applied to the entire exposed surface of the concrete as soon as the free water has disappeared from the surface after finishing. If evaporation is high and no moisture is present on the surface even though bleeding has not stopped, fog sprays shall be used to keep the surface moist until setting of the cement occurs and bleeding is complete. Curing compound shall then be immediately applied. Along the formed edge faces, it shall be applied immediately after the forms are removed. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water, and the curing compound applied as soon as the free water disappears. The curing compound shall be applied to the finished surfaces by means of an approved automatic spraying machine. The spraying machine shall be self-propelled and shall span the newly paved lane. The machine shall have one or more spraying nozzles that can be controlled and operated to completely and uniformly cover the pavement surface with the required amount of curing compound. The curing compound in the drum used for the spraying operation shall be thoroughly and continuously agitated mechanically throughout the full depth of the drum during the application. Air agitation may be used only to supplement mechanical agitation. Spraying pressure shall be sufficient to produce a fine spray as necessary to cover the surface thoroughly and completely with a uniform film. Spray equipment shall be kept clean and properly maintained and the spray nozzle or nozzles shall have adequate wind shields. The curing compound shall be applied with an overlapping coverage that will give a two-coat application at a coverage of 400 square feet per gallon, plus or minus 5.0 percent for each coat. A one-coat application may be applied provided a uniform application and coverage of 200 square feet per gallon, plus or minus 5.0 percent is obtained. The application of curing compound by hand-operated, mechanical powered pressure sprayers will be permitted only on odd widths or shapes of slabs where indicated and on concrete surfaces exposed by the removal of forms. When the application is made by hand-operated sprayers, the second coat shall be applied in a direction approximately at right angles to the direction of the first coat. The compound shall form a uniform, continuous, cohesive film that will not check, crack, or peel and that will be free from pinholes and other discontinuities. If pinholes, abrasions, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be immediately resprayed. The surfaces adjacent to joint sawcuts shall be cleaned and resprayed with curing compound immediately after cutting. Approved standby facilities for curing concrete pavement shall be provided at an accessible location at the job site for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

3.7.3 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the

entire curing period, or until curing compound is applied, commencing immediately after finishing. If forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day and that the entire surface is wet.

3.7.4 Impervious Sheet Curing

All surfaces shall be thoroughly wetted and then completely covered with the sheeting. Sheeting shall be at least 60 inches wider than the concrete surface to be covered. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 12 inches and securely weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

3.8 JOINTS

3.8.1 General Requirements for Joints

Joints shall conform to the details indicated and shall be perpendicular to the finished grade of the pavement. All joints shall be straight and continuous from edge to edge or end to end of the pavement with no abrupt offset and no gradual deviation greater than 1/2 inch. Before commencing construction, the Contractor shall submit for approval a control plan and equipment to be used for ensuring that all joints are straight from edge to edge of the pavement within the above tolerances. Where any joint fails to meet these tolerances, the slabs adjacent to the joint shall be removed and replaced at no additional cost to the Government. No change from the jointing pattern shown on the drawings shall be made without written approval of the Contracting Officer. Sealing of joints shall be in accordance with Section 02762 COMPRESSION JOINT SEALS FOR CONCRETE PAVEMENTS.

3.8.2 Longitudinal Construction Joints

Longitudinal construction joints between paving lanes shall be located as indicated. Dowels shall be installed in the longitudinal construction joints, or the edges shall be thickened as indicated. Dowels shall be installed in conformance with paragraph, Placing Dowels and Tie Bars. After the end of the curing period, longitudinal construction joints shall be sawed to provide a groove at the top for sealant conforming to the details and dimensions indicated.

3.8.3 Transverse Construction Joints

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for 30 minutes or longer. When concrete placement cannot be continued, the transverse construction joint shall be installed at a planned transverse joint, if possible. Transverse construction joints shall be constructed by utilizing headers and the very minimum amount of hand placement and finishing techniques. Pavement shall

be constructed with the paver as close to the header as possible, and the paver shall be run out completely past the header. Transverse construction joints installed at a planned transverse joint shall be constructed as shown or, if not shown otherwise, shall be dowelled. Those not at a planned transverse joint shall be constructed with tie bars and shall not be sawed or sealed.

3.8.4 Expansion Joints

Expansion joints shall be formed where indicated, and about any structures and features that project through or into the pavement, using joint filler of the type, thickness, and width indicated, and shall be installed to form a complete, uniform separation between the structure and the pavement. The filler shall be attached to the original concrete placement with adhesive or other fasteners and shall extend the full slab depth. Adjacent sections of filler shall be fitted tightly together, and the filler shall extend across the full width of the paving lane or other complete distance in order to prevent entrance of concrete into the expansion space. Edges of the concrete at the joint face shall be finished with an edger with a radius of 1/8 inch. The joint filler strips shall be installed 3/4 inch below the pavement surface with a slightly tapered, dressed-and-oiled wood strip or other approved material temporarily secured to the top of the filler to form a recess to be filled with joint sealant. The wood strip shall be removed soon after the concrete has set and the reservoir temporarily filled with an approved material to protect the reservoir until the joint sealer is installed. Expansion joints shall be constructed with thickened edges for load transfer.

3.8.5 Slip Joints

Slip joints shall be installed where indicated using the specified materials. Preformed joint filler material shall be attached to the face of the original concrete placement with adhesive or other fasteners. Bituminous material shall be applied to cover the entire surface of the face of the original concrete placement to a depth of 1/4 inch plus or minus 1/16 inch. Only a material which will remain in place on the vertical surface shall be used. In each case a 3/4 inch deep reservoir for joint sealant shall be constructed at the top of the joint. Edges of the joint face shall be finished with an edger with a radius of 1/8 inch.

3.8.6 Contraction Joints

Transverse and longitudinal contraction joints shall be of the weakened-plane or dummy type and shall be constructed as indicated. Longitudinal contraction joints shall be constructed by sawing a groove in the hardened concrete with a power-driven saw in conformance with requirements for sawed joints, unless otherwise approved in writing. Transverse contraction joints shall be constructed in conformance with requirements for sawed joints.

3.8.6.1 Sawed Joints

Sawed contraction joints shall be constructed by sawing an initial groove in the concrete with a 1/8 inch blade to the indicated depth. During sawing of joints, and again 24 hours later, the CQC team shall inspect all exposed lane edges for development of cracks below the saw cut, and shall immediately report results to the Contracting Officer. If the Contracting Officer determines that there are more uncracked joints than desired, the Contractor will be directed to saw succeeding joints 25 percent deeper than

originally indicated at no additional cost to the Government. After expiration of the curing period, the upper portion of the groove shall be widened by sawing to the width and depth indicated for the joint sealer. The time of initial sawing shall vary depending on existing and anticipated weather conditions and shall be such as to prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling, or tearing. The sawed faces of joints will be inspected for undercutting or washing of the concrete due to the early sawing, and sawing shall be delayed if undercutting is sufficiently deep to cause structural weakness or excessive roughness in the joint. The sawing operation shall be carried on as required during both day and night regardless of weather conditions. The joints shall be sawed at the required spacing consecutively in the sequence of the concrete placement. A chalk line or other suitable guide shall be used to mark the alignment of the joint. Before sawing a joint, the concrete shall be examined closely for cracks, and the joint shall not be sawed if a crack has occurred near the planned joint location. Sawing shall be discontinued when a crack develops ahead of the saw cut. Workmen and inspectors shall wear clean, rubber-soled footwear, and the number of persons walking on the pavement shall be limited to those actually performing the sawing operation. Immediately after the joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. The surface shall be resprayed with curing compound as soon as free water disappears. Necessary precautions shall be taken to insure that the concrete is properly cured at sawed joints, but that no curing compound enters the joints. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed with cord, backer rod, or other approved material before the concrete in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period and shall prevent infiltration of foreign material until removed immediately before sawing joint sealant reservoir. The sawing equipment shall be adequate in the number of units and the power to complete the sawing at the required rate. An ample supply of saw blades shall be available on the job before concrete placement is started and at all times during sawing. At least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operation.

3.8.7 Thickened Edge Joints

Thickened edge joints shall be constructed as indicated on the drawings. Underlying material in the transition area shall be graded as shown and shall meet the requirements for smoothness and compaction specified for all other areas of the underlying material.

3.8.8 Sealing Joints

Joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit. Sawing or other removal of filler type joint formers shall be accomplished immediately before sealing of the joints. Joints shall be sealed as specified in Section 02762A COMPRESSION JOINT SEALS FOR CONCRETE PAVEMENTS.

3.9 REPAIR, REMOVAL, REPLACEMENT OF SLABS

3.9.1 General Criteria

New pavement slabs that are broken or contain cracks shall be removed and replaced or repaired, as specified hereinafter at no cost to the Government. Spalls along joints shall be repaired as specified. Where removal of partial slabs is permitted, as specified, removal and replacement shall be full depth, shall be full width of the paving lane, and the limit of removal shall be normal to the paving lane and not less than 10 feet from each original transverse joint (i.e., removal portion shall be at least 10 feet longitudinally, and portion to remain in place shall be at least longitudinally; thus, if original slab length is less than 20 feet, the entire slab shall be removed). The Contracting Officer will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be at least 6 inch diameter, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Government. All epoxy resin used in this work shall conform to paragraph EPOXY RESIN, Type and Grade as specified.

3.9.2 Slabs with Cracks Thru Interior Areas

Interior area is defined as that area more than 24 inches from either adjacent original transverse joint. Slabs with any cracks that extend into the interior area, regardless of direction, shall be treated by one of the following procedures.

3.9.2.1 Cracks That Do Not Extend Full Depth of Slab

These cracks, and similar cracks within the areas 24 inches each side of transverse joints, shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1, using procedures as approved. The procedure shall not widen the crack during epoxy resin injection. All epoxy resin injection shall take place in the presence of a representative of the Contracting Officer.

3.9.2.2 Cracks That Extend Full Depth of Slab

Where there is any full depth crack at any place within the interior area, the full slab shall be removed. However, if the cracked area all lies within 10 feet of one original transverse joint, only a partial slab need be removed provided all criteria specified above for distance from each original transverse joint is met.

3.9.3 Cracks close to and Parallel to Transverse Joints

All cracks essentially parallel to original transverse joints, extending full depth of the slab, and lying wholly within 24 inches either side of the joint shall be treated as specified hereinafter. Any crack extending more than 24 inches from the transverse joint shall be treated as specified above for Slabs With Cracks Through Interior Areas. Any cracks which do not extend full depth of the slab shall be treated as specified above in subparagraph, Cracks That Do Not Extend Full Depth Of Slab, and the original transverse joint constructed as originally designed.

3.9.3.1 Full Depth Cracks Present, Original Joint Not Opened

When the original transverse joint has not opened, the crack shall be routed and sealed, and the original transverse joint filled with epoxy resin. The crack shall be routed with an easily guided, wheel mounted,

vertical shaft, powered rotary router designed so the routing spindle will caster as it moves along the crack, or with a small diameter saw designed for this use. The reservoir for joint sealant in the crack shall be formed by routing to a depth of $3/4$ inch, plus or minus $1/16$ inch, and to a width of $5/8$ inch, plus or minus $1/8$ inch. Any equipment or procedure which causes ravelling or spalling along the crack shall be modified or replaced to prevent such ravelling or spalling. The joint sealant shall be a liquid sealant as specified for rigid pavement joints. Installation of joint seal shall be as specified for sealing joints or as directed. The uncracked transverse joint shall be filled with epoxy resin. If the joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures. If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. If filler material (joint insert) has been used to form a weakened plane in the transverse joint, it shall be completely sawed out and the saw cut pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. Where a parallel crack goes part way across the paving lane and then intersects and follows the original transverse joint which is cracked only for the remainder of the width, it shall be treated as follows: The area with the separate crack shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

3.9.3.2 Full Depth Cracks, Original Joint Also Cracked

At a transverse joint, if there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, a section of the slab containing the crack shall be removed and replaced for the full lane width and at least 10 feet long. If this partial slab removal places the limit of removal less than 10 feet from the next transverse joint, the entire slab shall be removed. If the parallel crack crosses the transverse joint line, a similar area shall be removed and replaced in both slabs.

3.9.4 Removal and Replacement of Full Slabs

Where it is necessary to remove full slabs, unless there are dowels present, all edges of the slab shall be cut full depth with a concrete saw. All saw cuts shall be perpendicular to the slab surface. If dowels, are present along any edges, these edges shall be sawed full depth just beyond the end of dowels or tie bars if they are present. These joints shall then be carefully sawed on the joint line to within 1 inch of the depth of the dowel. The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and approved safe lifting devices used for attachment to the slabs. The narrow strips along keyed or doweled edges shall be carefully broken up and removed using light, hand-held jackhammers, 30 lb or less, or other approved similar equipment. Care shall be taken to prevent damage to the dowels, tie bars, or keys or to concrete to remain in place. The joint face below keys or dowels shall be suitably trimmed so that there is no abrupt offset in any direction greater than $1/2$ inch and no gradual offset greater than 1 inch when tested in a horizontal direction with a straightedge. No mechanical impact breakers, other than the above hand-held equipment shall be used for any removal of slabs. If underbreak between $1-1/2$ and 4 inches deep occurs at any point along any edge, the area shall be repaired as directed before replacing the removed slab. Procedures directed will be similar to those

specified for surface spalls, modified as necessary. If underbreak over 4 inches deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels or where they have been damaged, dowels of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete using procedures as specified in paragraph, Placing Dowels. Original damaged dowels or tie bars shall be cut off flush with the joint face. Protruding portions of dowels shall be painted and lightly oiled. All four edges of the new slab shall thus contain dowels. Placement of concrete shall be as specified for original construction. Prior to placement of new concrete, the underlying material shall be recompact and shaped as specified in the appropriate section of these specifications, and the surfaces of all four joint faces shall be cleaned of all loose material and contaminants and coated with a double application of membrane forming curing compound as bond breaker. Care shall be taken to prevent any curing compound from contacting dowels or tie bars. The resulting joints around the new slab shall be prepared and sealed as specified for original construction.

3.9.5 Removal and Replacement of Partial Slabs

Where the above criteria permits removal of partial slabs, removal and replacement operations shall be as specified for full slabs, except that the joint between the removed area and the partial slab to remain in place shall consist of a full depth saw cut across the full lane width and perpendicular to the centerline of the paving lane. Replacement operations shall be the same as specified above, except that, at the joint between the removed area and the partial slab to remain, deformed tie bars shall be epoxy resin grouted into holes drilled into the slab to remain in place. Size and spacing of the tie bars shall be as specified for dowels. Drilling of holes and installation of tie bars shall be as specified for dowels in paragraph, Placing Dowels and Tie Bars, except that no portion of the tie bars shall be painted or oiled. No curing compound shall be used on this joint face and, immediately before placing new concrete, the joint surface of the partial slab remaining in place shall be coated with epoxy resin, Type V, Grade 2.

3.9.6 Repairing Spalls Along Joints

Where directed, spalls along joints of new slabs, along edges of adjacent existing concrete, and along parallel cracks shall be repaired by first making a vertical saw cut at least 1 inch outside the spalled area and to a depth of at least 2 inches. Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out to remove all unsound concrete and at least a depth of 1/2 inch of visually sound concrete. The cavity thus formed shall be thoroughly cleaned with high pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Prime coat for portland cement repairs shall be a neat cement grout and for epoxy resin repairs shall be epoxy resin, Type III, Grade 1. The cavity shall be filled with low slump portland cement concrete or mortar or with epoxy resin concrete or mortar. Portland cement concrete shall be used for larger spalls, those more than 1/3 cu. ft. in size after removal operations; portland cement mortar shall be used for spalls between 0.03 cu. ft. and 1/3 cu. ft.; and epoxy resin mortar or Type III, Grade 3 epoxy resin for those spalls less than 0.03 cu. ft. in size

after removal operations. Portland cement concretes and mortars shall be very low slump mixtures, 1/2 inch slump or less, proportioned, mixed, placed, consolidated by tamping, and cured, all as directed. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions and mixing and placing procedures as recommended by the manufacturer and approved by the Contracting Officer. The epoxy resin materials shall be placed in the cavity in layers not over 2 inches thick. The time interval between placement of additional layers shall be such that the temperature of the epoxy resin material does not exceed 140 degrees F at any time during hardening. Mechanical vibrators and hand tampers shall be used to consolidate the concrete or mortar. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and then sealed with the sealer specified for the joints. If any spall penetrates half the depth of the slab or more, the entire slab, or 10 foot portion thereof, shall be removed and replaced as previously specified.

3.10 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR

Existing concrete pavement shall be removed as indicated and as specified in Section 02220A DEMOLITION, modified, and expanded as specified herein. Repairs shall be made as indicated and as specified herein. All operations shall be carefully controlled to prevent damage to the concrete pavement and to the underlying material to remain in place. All saw cuts shall be made perpendicular to the slab surface, and forming rectangular areas.

3.10.1 Removal of Existing Pavement Slab

When existing concrete pavement is to be removed and adjacent concrete is to be left in place, the joint between the removal area and adjoining pavement to stay in place including dowels, shall first be cut full depth with a standard diamond-type concrete saw. If dowels are present at this joint, the saw cut shall be made just beyond the end of dowels. The edge shall then be carefully sawed on the joint line to within 1 inch of the top of the dowel. Next, a full depth saw cut shall be made parallel to the joint at least 24 inches from the joint and at least 6 inches from the end of any dowels. This saw cut shall be made with a wheel saw as specified in paragraph SAWING EQUIPMENT. All pavement to be removed beyond this last saw cut shall be removed using equipment and procedures specified in Section 02220A DEMOLITION and as approved. All pavement between this last saw cut and the joint line shall be removed by carefully pulling pieces and blocks away from the joint face with suitable equipment and then picking them up for removal. In lieu of this method, this strip of concrete may be carefully broken up and removed using hand-held jackhammers, 30 lb or less, or other approved light-duty equipment which will not cause stress to propagate across the joint saw cut and cause distress in the pavement which is to remain in place. In lieu of the above specified removal method, the slab may be sawcut full depth to divide it into several pieces and each piece lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and safe lifting devices used for attachment to the slab. Where dowels or keys are present, care shall be taken to produce an even, vertical joint face below the dowels. This joint face shall be trimmed so that there is no abrupt offset in any direction greater than 1/2 inch and no gradual offset greater than 1 inch when tested in a horizontal direction with a straightedge. If the Contractor is unable to produce such

a joint face, or if underbreak or other distress occurs, the Contractor shall saw the dowels flush with the joint. The Contractor shall then install new dowels, of the size and spacing used for other similar joints, by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph, Placing dowels. All this shall be at no additional cost to the Government. Dowels of the size and spacing indicated shall be installed as shown on the drawings by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph, Placing Dowels.

3.10.2 Edge Repair

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Areas which are damaged during construction shall be repaired at no cost to the Government; repair of previously existing damage areas will be considered a subsidiary part of concrete pavement construction.

3.10.2.1 Spall Repair

Spalls along joints and along cracks shall be repaired where indicated and where directed. Repair materials and procedures shall be as previously specified in subparagraph, Repairing Spalls Along Joints.

3.10.2.2 Underbreak Repair

All underbreak shall be repaired. First, all delaminated and loose material shall be carefully removed. Next, the underlying material shall be recompact, without addition of any new material. Finally, the void shall be completely hand-filled with paving concrete mixture, thoroughly consolidated. Care shall be taken to produce an even joint face from top to bottom. Prior to placing concrete, the underlying material shall be thoroughly moistened. After placement, the exposed surface shall be heavily coated with curing compound. All this shall be done at least 24 hours before placing the new paving concrete against the joint.

3.10.2.3 Underlying Material

The underlying material adjacent to the edge of and under the existing pavement which is to remain in place shall be protected from damage or disturbance during removal operations and until placement of new concrete, and shall be shaped as shown on the drawings or as directed. Sufficient underlying material shall be kept in place outside the joint line to completely prevent disturbance of material under the pavement which is to remain in place. Any material under the portion of the concrete pavement to remain in place which is disturbed or loses its compaction shall be carefully removed and replaced with concrete as specified above under Underbreak Repair. The underlying material outside the joint line shall be thoroughly compacted and shall be moist when new concrete is placed.

3.11 PAVEMENT PROTECTION

The Contractor shall protect the pavement against all damage prior to final acceptance of the work by the Government. Aggregates rubble, or other similar construction materials shall not be piled on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least 14 days old, or for a longer period if so directed. As a construction expedient in paving intermediate lanes between newly paved pilot lanes, operation of the hauling equipment will be permitted on the new pavement after the pavement

has been cured for 7 days and the joints have been sealed or otherwise protected. Also, the subgrade planer, concrete paving and finishing machines, and similar equipment may be permitted to ride upon the edges of previously constructed slabs when the concrete has attained a minimum flexural strength of 400 psi and approved means are furnished to prevent damage to the slab edge. All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean, and spillage of concrete or other materials shall be cleaned up immediately upon occurrence. Special care shall be used where Contractor's traffic uses or crosses active airfield pavement. In these areas, if necessary in order to accomplish this, full-time workmen with hand brooms shall be used at anytime there is traffic. Other existing pavements used by the Contractor shall be power broomed at least daily when traffic operates. For fill-in lanes, equipment shall be used that will not damage or spall the edges or joints of the previously constructed pavement.

3.12 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

3.12.1 Testing and Inspection by Contractor

The Contractor shall perform the inspection and tests described below, and based upon the results of these inspections and tests, shall take the action required and submit reports as required. When, in the opinion of the Contracting Officer, the paving operation is out of control, concrete placement shall cease. The laboratory performing the tests shall be on-site and shall conform with ASTM C 1077. The individuals who sample and test concrete or the constituents of concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I. The individuals who perform the inspection of concrete shall have demonstrated a knowledge and ability equivalent to the ACI minimum guidelines for certification of Concrete Construction Inspector, Level II. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per year thereafter for conformance with ASTM C 1077. This testing shall be performed by the Contractor regardless of any other testing performed by the Government.

3.12.2 Testing and Inspection Requirements

3.12.2.1 Fine Aggregate

- a. Grading. At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits.
- b. Corrective Action for Fine Aggregate Grading. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall be immediately reported to the Contracting Officer, paving shall be stopped, and immediate steps taken to correct the grading.

3.12.2.2 Coarse Aggregate

- a. Grading. At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt approved limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling.
- b. Corrective Action for Grading. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer, and steps taken to correct the grading. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer, paving shall be stopped, and immediate steps shall be taken to correct the grading.

3.12.2.3 Quality of Aggregates

Thirty days prior to the start of concrete placement, the Contractor shall perform all tests specified for aggregate quality, including deleterious materials. In addition, after the start of paving, the Contractor shall perform similar tests for aggregate quality at least once every month, and when the source of aggregate or aggregate quality changes. Testing interval may be increased to three months when the previous two tests indicate the aggregate meets all quality requirements. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

3.12.2.4 Scales, Batching and Recording

- a. Weighing Accuracy. The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every month for conformance with specified requirements. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors.
- b. Batching and Recording Accuracy. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required mass, recorded mass, and the actual mass batched. The Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately.
- c. Corrective Action. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.12.2.5 Batch-Plant Control

The measurement of all constituent materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate masses and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water masses per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water masses per cubic yard for each class of concrete batched during each day's plant operation.

3.12.2.6 Concrete Mixture

- a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two other tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of paving. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231. Test results shall be plotted on control charts which are kept current and shall, at all times, be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an average line is set at the midpoint of the specified air content range from paragraph SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content shall be taken at the paving site. The Contractor shall deliver the concrete to the paving site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the paving site, correlation samples shall be taken at the paving site as required by the Contracting Officer, and the air content at the mixer controlled as directed.
- b. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment,

another test shall be made to verify the result of the adjustment.

Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to insure that it is operating accurately and with good reproducibility. Whenever a point on either control chart (single test or result of two tests made concurrently, as specified above) reaches an action limit line, the air content shall be considered out of control and the paving operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when paving is restarted.

- c. Slump Testing. Slump tests shall be made when test specimens are fabricated. In addition, at least four other slump tests shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond the upper action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control chart for slump and the chart for range, and for determining need for any remedial action. An upper warning limit shall be set at 1/2 inch below the maximum allowable slump on separate control charts for slump used for each type of mixture as specified in paragraph, SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES, and an upper action limit line shall be set at the maximum allowable slump, as specified in the same paragraph for fixed form paving or as selected by the Contractor at the start of the project for slipform paving. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 1-1/2 inches. Samples for slump shall be taken at the paving site. The Contractor is responsible for delivering the concrete to the paving site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the paving site, correlation samples shall be taken at the paving site as required by the Contracting Officer, and the slump at the mixer controlled as directed.
- d. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an approved adjustment shall immediately be made in the batch masses of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c specified, based on aggregates which are in a saturated surface dry condition. When a slump result (average of two tests made concurrently, as specified above) exceeds the upper action limit, no further concrete shall be delivered to the paving site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch masses, produce a point on the control chart for range at or above

the upper action limit, the paving operation shall immediately be halted, and the Contractor shall take approved steps to bring the slump under control. Additional slump tests shall be made as directed.

- e. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064. The temperature shall be reported along with the compressive strength data.

3.12.2.7 Concrete Strength Testing for CQC

Contractor Quality Control operations for concrete strength shall consist of the following steps:

- a. Take samples for strength tests at the paving site. Fabricate and cure test cylinders in accordance with ASTM C 31; test them in accordance with ASTM C 39.
- b. Fabricate and cure 2 test cylinders per subplot from the same batch or truckload and at the same time acceptance cylinders are fabricated and test them for compressive strength at 7-day age.
- c. Average all 8 compressive tests per lot. Convert this average 7-day compressive strength per lot to equivalent 28-day flexural strength using the Correlation Ratio determined during mixture proportioning studies.
- d. Compare the equivalent 28-day flexural strength from the conversion to the Average Flexural Strength Required for Mixtures from paragraph of same title.
- e. If the equivalent average 28-day strength for the lot is below the Average Flexural Strength Required for Mixtures by 20 psi flexural strength or more, at any time, adjust the mixture to increase the strength, as approved.
- f. If the equivalent average 28-day strength is above the Average Flexural Strength Required for Mixtures by 20 psi flexural strength or more for 2 consecutive days, the Contractor will be permitted to adjust the mixture to decrease the strength, as approved.
- g. The Contractor's CQC testing agency shall maintain up-to-date control charts for strength, showing the 7-day CQC compressive strength, the 14-day compressive strength (from acceptance tests) and the 28-day equivalent flexural strength of each of these for each lot.

3.12.2.8 Inspection Before Placing

Underlying materials, construction joint faces, forms, reinforcing, dowels, and embedded items shall be inspected by the Contractor in sufficient time prior to each paving operation in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.12.2.9 Paving

- a. Paving Inspection. The placing foreman shall supervise all placing and paving operations, shall determine that the correct quality of concrete is placed in each location as shown and that finishing is performed as specified; shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume of concrete placed, and method of paving and any problems encountered.
- b. Placing and Paving Corrective Action. The paving foreman shall not permit batching and paving to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Paving shall not be continued if piles of concrete exist or if the concrete is inadequately consolidated or if surface finish is not satisfactory. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.12.2.10 Vibrators

- a. Vibrator Testing and Use. The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when paving is in progress. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing.
- b. Vibrator Corrective Action. Any vibrator not meeting the requirements of subparagraphs, Paver-Finisher and Consolidation, shall be immediately removed from service and repaired or replaced.

3.12.2.11 Curing Inspection

- a. Moist Curing Inspections. At least twice each shift, and not less than four times per day (never more than 7 hours apart) on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
- b. Moist Curing Corrective Action. When any inspection finds an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for the area shall be extended by 1 day.
- c. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each day's operation, the quantity of compound used shall be determined by measurement of the container and the area of concrete surface covered; the Contractor shall then compute the rate of coverage in square feet per gallon and shall also note whether or not coverage is uniform.

All this shall be reported daily.

- d. Membrane Curing Corrective Action. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.
- e. Sheet Curing Inspection. At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.
- f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

3.12.2.12 Cold-Weather Protection

At least once each shift and once per day on non-work days, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

3.12.2.13 Mixer Uniformity

- a. Stationary Mixers. Prior to the start of concrete placing and once every 4 months when concrete is being placed, or once for every 50,000 cubic yards of concrete placed, whichever results in the longest time interval, uniformity of concrete mixing shall be determined in accordance with COE CRD-C 55. The original test shall be a Regular Test. After the mixing operation has been tested and approved, subsequent tests shall be Abbreviated Tests.
- b. Truck Mixers. Prior to the start of concrete placing and at least once every 4 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.
- c. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved. After adjustments have been made, another uniformity test shall be made.

3.12.2.14 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be

confirmed in writing in the routine reports. The Contracting Officer has the right to examine all contractor quality control records.

-- End of Section --

SECTION 02760A

FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS
03/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in this text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D 789	(1998) Determination of Relative Viscosity and Moisture Content of Polyamide (PA)
ASTM D 5893	(1996) Cold Applied, Single Component Chemically Curing Silicon Joint Sealant for Portland Cement Concrete Pavement

FEDERAL SPECIFICATIONS (FS)

FS SS-S-200	(Rev E; Am 2) Sealant, Joint, Two-Component, Jet-Blast-Resistant, Cold-Applied, for Portland Cement Concrete Pavement
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's Recommendations; G.

Where installation procedures, or any part thereof, are required to be in accordance with the manufacturer's recommendations, printed copies of these recommendations, 5 days prior to use on the project. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

Construction Equipment List; .

List of proposed equipment to be used in performance of construction work including descriptive data, 7 days prior to use on the project.

SD-04 Samples

Materials; G.

Samples of the materials (sealant, primer if required, and backup material), in sufficient quantity for testing and approval 7 days prior to the beginning of work. No material will be allowed to be used until it has been approved.

1.3 SAFETY

Joint sealant shall not be placed within 25 feet of any liquid oxygen (LOX) equipment, LOX storage, or LOX piping. Joints in this area shall be thoroughly cleaned and left unsealed.

1.4 TEST REQUIREMENTS

The joint sealant and backup or separating material shall be tested for conformance with the referenced applicable material specification. Testing of the materials shall be performed in an approved independent laboratory and certified copies of the test reports shall be submitted and approved 5 days prior to the use of the materials at the job site. Samples will be retained by the Government for possible future testing should the materials appear defective during or after application. Conformance with the requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of the in-place materials.

1.5 EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and shall be maintained in satisfactory condition at all times.

1.5.1 Joint Cleaning Equipment

1.5.1.1 Tractor-Mounted Routing Tool

The routing tool used for removing old sealant from the joints shall be of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

1.5.1.2 Concrete Saw

A self-propelled power saw with water-cooled diamond or abrasive saw blades will be provided for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

1.5.1.3 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. The maximum nozzle opening should not exceed 1/4 inch. The air compressor

shall be portable and shall be capable of furnishing not less than 150 cubic feet per minute and maintaining a line pressure of not less than 90 psi at the nozzle while in use. Compressor capability under job conditions must be demonstrated before approval. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjusted as necessary to secure satisfactory results.

1.5.1.4 Waterblasting Equipment

Waterblasting equipment shall include a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. The water tank and auxiliary resupply equipment shall be of sufficient capacity to permit continuous operations. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjustable as necessary to obtain satisfactory results. A pressure gauge mounted at the pump shall show at all times the pressure in pounds per square inch at which the equipment is operating.

1.5.1.5 Hand Tools

Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

1.5.2 Sealing Equipment

1.5.2.1 Cold-Applied, Single-Component Sealing Equipment

The equipment for installing ASTM D 5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. The initially approved equipment shall be maintained in good working condition, serviced in accordance with the supplier's instructions, and shall not be altered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

1.6 TRIAL JOINT SEALANT INSTALLATION

Prior to the cleaning and sealing of the joints for the entire project, a test section of at least 200 feet long shall be prepared using the specified materials and approved equipment, so as to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the test section and before any other joint is sealed, the test section shall be inspected to determine that the materials and installation meet the requirements specified. If it is determined that the materials or installation do not meet the requirements, the materials shall be removed, and the joints shall be recleaned and resealed at no cost to the Government. When the test section meets the requirements, it may be incorporated into the permanent work and paid for at the contract unit price per linear foot for sealing items scheduled. All other joints shall be prepared and sealed in the manner approved for sealing the test section.

1.7 DELIVERY AND STORAGE

Materials delivered to the job site shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall be provided by the Contractor at the job site for maintaining materials at the temperatures and conditions recommended by the manufacturer.

1.8 ENVIRONMENTAL CONDITIONS

The ambient air temperature and the pavement temperature within the joint wall shall be a minimum of 50 degrees F and rising at the time of application of the materials. Sealant shall not be applied if moisture is observed in the joint.

PART 2 PRODUCTS

2.1 SEALANTS

Materials for sealing cracks in the various paved areas indicated on the drawings shall be per ASTM D 5893.

2.2 PRIMERS

Primers, when their use is recommended by the manufacturer of the sealant, shall be as recommended by the manufacturer of the sealant.

2.3 BACKUP MATERIALS

The backup material shall be a compressible, nonshrinking, nonstaining, nonabsorbing material and shall be nonreactive with the joint sealant. The material shall have a melting point at least 5 degrees F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The material shall have a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C 509. The backup material shall be 25 plus or minus 5 percent larger in diameter than the nominal width of the crack.

2.4 BOND BREAKING TAPES

The bond breaking tape or separating material shall be a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 5 degrees F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The bond breaker tape shall be approximately 1/8 inch wider than the nominal width of the joint and shall not bond to the joint sealant.

PART 3 EXECUTION

3.1 PREPARATION OF JOINTS

Immediately before the installation of the sealant, the joints shall be thoroughly cleaned to remove all laitance, curing compound, filler, protrusions of hardened concrete, and old sealant from the sides and upper edges of the joint space to be sealed.

3.1.1 Existing Sealant Removal

The in-place sealant shall be cut loose from both joint faces and to the depth shown on the drawings, using the tractor-mounted routing equipment concrete saw waterblaster as specified in paragraph EQUIPMENT. Depth shall be sufficient to accommodate any separating or backup material that is required to maintain the depth of new sealant to be installed. Prior to further cleaning operations, all loose old sealant remaining in the joint opening shall be removed by blowing with compressed air. Hand tools may be required to remove sealant from random cracks. Chipping, spalling, or otherwise damaging the concrete will not be allowed.

3.1.2 Sawing

3.1.2.1 Refacing of Joints

Refacing of joints shall be accomplished using a concrete saw as specified in paragraph EQUIPMENT to remove all residual old sealant and a minimum of concrete from the joint face to provide exposure of newly cleaned concrete, and, if required, to enlarge the joint opening to the width and depth shown on the drawings. to saw through sawed and filler-type joints to loosen and remove material until the joint is clean and open to the full specified width and depth. The blade shall be stiffened with a sufficient number of suitable dummy (used) blades or washers. Immediately following the sawing operation, the joint opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.2.2 Refacing of Random Cracks

Sawing of the cracks shall be accomplished using a power-driven concrete saw as specified in paragraph EQUIPMENT. The saw blade shall be 6 inches or less in diameter to enable the saw to follow the trace of the crack. The blade shall be stiffened as necessary with suitable dummy (or used) blades or washers. Immediately following the sawing operation, the crack opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.3 Sandblasting

The newly exposed concrete joint faces and the pavement surfaces extending a minimum of 1/2 inch from the joint edges shall be sandblasted clean. A multiple-pass technique shall be used until the surfaces are free of dust, dirt, curing compound, filler, old sealant residue, or any foreign debris that might prevent the bonding of the sealant to the concrete. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water.

3.1.4 Back-Up Material

When the joint opening is of a greater depth than indicated for the sealant depth, the lower portion of the joint opening shall be plugged or sealed off using a back-up material to prevent the entrance of the sealant below the specified depth. Care shall be taken to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

3.1.5 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, a bond

breaker separating tape will be inserted to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. The tape shall be securely bonded to the bottom of the joint opening so it will not float up into the new sealant.

3.1.6 Rate of Progress of Joint Preparation

The stages of joint preparation which include sandblasting, air pressure cleaning and placing of the back-up material shall be limited to only that lineal footage that can be sealed during the same day.

3.2 PREPARATION OF SEALANT

3.2.1 Single-Component, Cold-Applied Sealants

The ASTM D 5893 sealant and containers shall be inspected prior to use. Any materials that contain water, hard caking of any separated constituents, nonreversible jell, or materials that are otherwise unsatisfactory shall be rejected. Settlement of constituents in a soft mass that can be readily and uniformly remixed in the field with simple tools will not be cause for rejection.

3.3 INSTALLATION OF SEALANT

3.3.1 Time of Application

Joints shall be sealed immediately following final cleaning of the joint walls and following the placement of the separating or backup material. Open joints that cannot be sealed under the conditions specified, or when rain interrupts sealing operations shall be recleaned and allowed to dry prior to installing the sealant.

3.3.2 Sealing Joints

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, a final cleaning with compressed air shall be performed. The joints shall be filled from the bottom up to $[1/8]$ $[1/4]$ inch plus or minus $1/16$ inch below the pavement surface. Excess or spilled sealant shall be removed from the pavement by approved methods and shall be discarded. The sealant shall be installed in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, it shall be applied evenly to the joint faces in accordance with the manufacturer's instructions. Joints shall be checked frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.4 INSPECTION

3.4.1 Joint Cleaning

Joints shall be inspected during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any manner. Cleaned joints shall be approved prior to installation of the separating or back-up material and joint sealant.

3.4.2 Joint Sealant Application Equipment

The application equipment shall be inspected to ensure conformance to temperature requirements, proper proportioning and mixing (if two-component sealant) and proper installation. Evidences of bubbling, improper installation, failure to cure or set shall be cause to suspend operations until causes of the deficiencies are determined and corrected.

3.4.3 Joint Sealant

The joint sealant shall be inspected for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost to the Government.

3.5 CLEAN-UP

Upon completion of the project, all unused materials shall be removed from the site and the pavement shall be left in a clean condition.

-- End of Section --

SECTION 02762A

COMPRESSION JOINT SEALS FOR CONCRETE PAVEMENTS

11/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in this text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2628 (1991; R 1998) Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

ASTM D 2835 (1989; R 1998) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 548 (1988) Jet-Fuel and Heat Resistant Preformed Polychloroprene Elastomeric Joint Seals for Rigid Pavements

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment; FIO, RE

List of proposed equipment to be used in the performance of construction work, including descriptive data, 30 days prior to use on the project.

Manufacturer's Instructions; FIO, RE

Where installation procedures are required in accordance with the manufacturer's recommendations, printed copies of manufacturers' instructions, 30 days prior to use on the project.

SD-04, Samples

Compression Seals; FIO, RE

Regardless of testing responsibility, 4 foot long samples of the materials, 60 days prior to use on the project. Printed

directions from the manufacturer on recommended installation criteria shall be furnished with the samples plus the manufacturer's certification that the selected seal is recommended for the installation on this project.

SD-06 Test Reports

Test Requirements; FIO, RE

Certified copies of test results, 30 days prior to use of material on the project.

1.3 TEST REQUIREMENTS

Each lot of compression joint seal and lubricant/adhesive shall be sampled, identified, and tested for conformance with the applicable material specification. A lot of compression seal shall consist of 1 day's production or 20,000 linear feet for each cross section, whichever is less.

A lot of lubricant/adhesive shall consist of 1 day's production. Testing of the compression joint seal and lubricant/adhesive material shall be the responsibility of the Contractor and shall be performed in an approved independent laboratory, and certified copies of the test reports shall be submitted for approval 30 days prior to the use of the materials at the jobsite. Samples of each lot of material shall also be submitted and will be retained by the Government for possible future testing should the materials appear defective during or after application. The Contractor shall furnish additional samples of materials, in sufficient quantity to be tested, upon request. Final acceptance will be based on conformance to the specified test requirements and the performance of the in-place materials.

1.4 EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and shall be maintained in satisfactory condition at all times.

1.4.1 Joint Cleaning Equipment

1.4.1.1 Concrete Saw

A self-propelled power saw with water-cooled diamond saw blades shall be provided for cutting joints to the depths and widths specified and for removing filler, existing old joint seal, or other material embedded in the joints or adhered to the joint faces.

1.4.1.2 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hose, and a long-wearing venturi-type nozzle of proper size, shape, and opening. The maximum nozzle opening should not exceed 1/4 inch. The air compressor shall be portable and shall be capable of furnishing not less than 150 cubic feet per minute and maintaining a line pressure of not less than 90 psi at the nozzle while in use. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint about 1 inch above the pavement surface and will direct the blast to clean the joint walls. The height, angle of inclination, and the size of the nozzle shall be adjusted as necessary to ensure satisfactory results.

1.4.1.3 Waterblasting Equipment

Waterblasting equipment shall include a trailer-mounted water tank, pumps, high-pressure hose, a wand with safety release cutoff controls, nozzle, and auxiliary water resupply equipment. The water tank and auxiliary water resupply equipment shall be of sufficient capacity to permit continuous operations. The pumps, hoses, wand, and nozzle shall be of sufficient capacity to permit the cleaning of both walls of the joint and the pavement surface for a width of at least 1/2 inch on either side of the joint. A pressure gauge mounted at the pump shall show at all times the pressure in psi at which the equipment is operating.

1.4.2 Sealing Equipment

Equipment used to install the compression seal shall place the compression seal to the prescribed depths within the specified tolerances without cutting, nicking, twisting, or otherwise damaging the seal. The equipment shall be capable of placing the seal with not more than two percent longitudinal stretch or compression of the seal during installation. The machine shall be an automatic self-propelled joint seal application equipment and engine powered. The machine shall include a reservoir for the lubricant/adhesive, a device for conveying the lubricant/adhesive in the proper quantities to the sides of the compression seal or the sidewalls of the joints, a reel capable of holding one full spool of compression seal, and a power-driven apparatus for feeding the joint seal through a compression device and inserting the seal into the joint. The equipment shall also include a guide to maintain the proper course along the joint being sealed. The machine shall at all times be operated by an experienced operator.

1.5 TRIAL JOINT SEAL AND LUBRICANT/ADHESIVE INSTALLATION

Prior to the cleaning and sealing of the joints for the entire project, a test section at least 200 feet long shall be prepared at a designated location in the project pavement, using the specified materials and the approved equipment to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the trial length and before any other joint is sealed, the trial joints will be inspected by the Government to determine that the materials and installation meet the requirements specified. If materials or installation do not meet requirements, the materials shall be removed, and the joints shall be recleaned and resealed at no cost to the Government. No other joints shall be sealed until the test installation has been approved. If the trial section is approved, it may be incorporated into the permanent work. Other joints shall be sealed in the manner approved for sealing the trial joint.

1.6 DELIVERY AND STORAGE

Materials delivered to the jobsite shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall protect materials from weather and shall maintain materials at temperatures recommended by the manufacturer.

1.7 ENVIRONMENTAL CONDITIONS

The ambient temperature and the pavement temperature within the joint wall shall be at least 35 degrees F and rising at the time of installation of

the materials. Sealant installation will not be allowed if moisture or foreign material is observed in the joint.

PART 2 PRODUCTS

2.1 COMPRESSION SEALS

Compression joint seal materials shall be a vulcanized elastomeric compound using polychloroprene as the only base polymer. The material and manufactured seal shall conform to ASTM D 2628 and COE CRD-C 548 where jet fuel and/or heat blast resistance is required]. The joint seal shall be a labyrinth type seal. The uncompressed depth of the face of the compression seal (that is to be bonded to the joint wall) shall be greater than the uncompressed width of the seal, except that for seals 1 inch or greater in width, the depth need be only 1 inch or greater. The actual width of the uncompressed seal for construction and contraction joints shall be 0.75 or 1 inches and for expansion joints shall be 1.25 inches. The tolerance on the seal shall be plus 1/8 inch or minus 1/16 inch.

2.2 LUBRICANT/ADHESIVE

Lubricant/adhesive used for the compression elastomeric joint seal shall be a one-component compound conforming to ASTM D 2835.

PART 3 EXECUTION

3.1 PREPARATION OF JOINTS

Immediately before installation of the compression joint seal, the joints shall be thoroughly cleaned to remove laitance, filler, existing sealer, foreign material and protrusions of hardened concrete from the sides and upper edges of the joint space to be sealed. Cleaning shall be by sandblasting or waterblasting and shall extend along pavement surfaces at least 1/2 inch on either side of the joint. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water. The Contractor shall demonstrate that the selected cleaning operation meets the cleanliness requirements. Any irregularity in the joint face which would prevent uniform contact between the joint seal and the joint face shall be corrected prior to the installation of the joint seal.

3.1.1 Sawing

Joints shall be cleaned and opened to the specified width and depth by sawing. Immediately following the sawing operation, the joint faces and opening shall be thoroughly cleaned using a water jet to remove saw cuttings or debris remaining on the faces or in the joint opening. Compression seal shall be installed within 3 calendar days of the time the joint cavity is sawed. Depth of the joint cavity shall be per manufacturer's instructions. The saw cut for the joint seal cavity shall be centered over the joint line. The nominal width of the sawed joint seal cavity shall be as follows; the actual width shall be within a tolerance of plus or minus 1/16 inch:

- a. If a nominal 13/16 inch wide compression seal is furnished, the nominal width of the saw cut shall be 8/16 inches when the pavement temperature at the time of sawing is between 30 and 110 degrees F. If the pavement temperature at the time of sawing is above this range, the nominal width of the saw cut shall be

decreased 1/16 inch. If the pavement temperature at the time of sawing is below this range, the nominal width of the saw cut shall be increased 1/16 inch.

- b. If a nominal 1 inch wide compression seal is furnished, the nominal width of the saw cut shall be 9/16 inches when the pavement temperature at the time of sawing is between 30 and 110 degrees F. If the pavement temperature at the time of sawing is above this range, the nominal width of the saw cut shall be decreased 1/16 inch. If the pavement temperature at the time of sawing is below this range, the nominal width of the saw cut shall be increased 1/16 inch.
- c. The pavement temperature shall be measured in the presence of the Contracting Officer. Measurement shall be made each day before commencing sawing and at any other time during the day when the temperature appears to be varying from the allowable sawing range.

3.1.2 Sandblast Cleaning

A multiple pass sandblasting technique shall be used until the surfaces are free of dust, dirt, curing compound, or any residue that might prevent ready insertion or uniform contact of the seal and bonding of the lubricant/adhesive to the concrete.

3.1.3 Waterblast Cleaning

A multiple pass waterblast technique shall be used until the surfaces are free of dust, dirt, curing compound, or any residue that might prevent ready insertion or uniform contact of the seal and bonding of the lubricant/adhesive to the concrete.

3.1.4 Rate of Progress

Sandblasting or waterblasting of joint faces shall be limited to the length of joint that can be sealed during the same workday.

3.2 INSTALLATION OF THE COMPRESSION SEAL

3.2.1 Time of Installation

Joints shall be sealed immediately within 3 calendar days of sawing the joint seal cavity and following concrete cure and the final cleaning of the joint walls. Open joints ready for sealing that cannot be sealed under the specified conditions shall be provided with an approved temporary seal to prevent infiltration of foreign material. When rain interrupts the sealing operations, the joints shall be washed, air pressure cleaned, and allowed to dry prior to installing the lubricant/adhesive and compression seal.

3.2.2 Sequence of Installation

Longitudinal joints shall be sealed first, followed by transverse joints. Seals in longitudinal joints shall be installed so that all transverse joint seals will be intact from edge to edge of the pavement. Intersections shall be made monolithic by use of joint seal adhesive and care in fitting the intersection parts together. Extender pieces of seal shall not be used at intersections. Any seal falling short at the intersection shall be removed and replaced with new seal at no additional cost to the Government. Seals that are required to change direction by

more than 20 degrees, may require a poured sealant at the intersection. Poured sealant shall be per compression seal manufacturer's instructions.

3.3 SEALING OF JOINTS

The sides of the joint seal or the sides of the joint shall be covered with a coating of lubricant/adhesive and the seal installed as specified. Butt joints and seal intersections shall be coated with liberal applications of lubricant/adhesive. Lubricant/adhesive spilled on the pavement shall be removed immediately to prevent setting on the pavement. The in-place joint seal shall be in an upright position and free from twisting, distortion, and cuts. Adjustments shall be made to the installation equipment and procedure, if the stretch exceeds 1 percent. Any seal exceeding 2 percent stretch shall be removed and replaced. The joint seal shall be placed at a uniform depth within the tolerances specified. In-place joint seal which fails to meet the specified requirements shall be removed and replaced with new joint seal at no cost to the Government. The compression joint seal shall be placed to a depth of 1/4 inch, plus or minus 1/8 inch, below the pavement surface except when the joint is beveled or has a radius at the surface, or unless otherwise directed. For beveled joints or joints with a radius at the surface, the compression joint seal shall be installed at a depth of 1/8 inch, plus or minus 1/8 inch, below the bottom of the edge of the bevel or radius. No part of the seal shall be allowed to project above the surface of the pavement or above the edge of the bevel or radius. The seal shall be installed in the longest practicable lengths in longitudinal joints and shall be cut at the joint intersections to provide continuous installation of the seal in the transverse joints. The lubricant/adhesive in the longitudinal joints shall be allowed to set for 1 hour prior to cutting at the joint intersections to reduce the possibility of shrinkage. For all transverse joints, the minimum length of the compression joint seal shall be the pavement width from edge to edge.

3.4 CLEAN-UP

Upon completion of the project, all unused materials shall be removed from the site, any lubricant/adhesive on the pavement surface shall be removed, and the pavement shall be left in clean condition.

3.5 QUALITY CONTROL PROVISIONS

3.5.1 Application Equipment

The application equipment shall be inspected to assure uniform application of lubricant/adhesive to the sides of the compression joint seal or the walls of the joint. If any equipment causes cutting, twisting, nicking, excessive stretching or compressing of the seal, or improper application of the lubricant/adhesive, the operation shall be suspended until causes of the deficiencies are determined and corrected.

3.5.2 Procedures

3.5.2.1 Quality Control Inspection

Quality control provisions shall be provided during the joint cleaning process to prevent or correct improper equipment and cleaning techniques that damage the concrete in any manner. Cleaned joints shall be approved by the Government prior to installation of the lubricant/adhesive and compression joint seal.

3.5.2.2 Conformance to Stretching and compression Limitations

Conformance to stretching and compression limitations shall be determined. The top surface of the compression seal shall be marked at 1 foot intervals in a manner clear and durable to enable length determinations of the seal. After installation, the distance between the marks shall be measured on the seal. If the stretching or compression exceeds 2 percent, the seal shall be removed and replaced with new joint at no additional cost to the Government. The seal shall be removed up to the last correct measurement. The seal shall be inspected a minimum of once per 100 feet of seal for compliance to the shrinkage or compression requirements. Measurements shall also be made at the same interval to determine conformance with depth and width of installation requirements. Compression seal that is not in conformance with specification requirements shall be removed and replaced with new joint seal at no additional cost to the Government.

3.5.2.3 Pavement Temperature

The pavement temperature shall be determined by placing a thermometer in the initial saw cut for the joint and the reading shall be recorded. The thermometer shall remain in the joint for an adequate time to provide a control reading.

3.5.3 Product

The joint sealing system (compression seal and lubricant/adhesive) shall be inspected for proper rate of cure and bonding to the concrete, cuts, twists, nicks and other deficiencies. Seals exhibiting any defects, at any time prior to final acceptance of the project, shall be removed from the joint, wasted, and replaced in a satisfactory manner.

-- End of Section --

SECTION 02763A

PAVEMENT MARKINGS

04/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 247 (1981; R 1996) Glass Beads Used in Traffic Paint

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 792 (1998) Density and Specific Gravity
(Relative Density) of Plastics by Displacement

ASTM D 4280 (1996) Extended Life Type, Nonplowable,
Prismatic, Raised, Retroreflective Pavement Markers

ASTM D 4505 (1996) Preformed Plastic Pavement Marking
Tape for Extended Service Life

ASTM E 28 (1999) Softening Point of Resins by Ring
and Ball Apparatus

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-B-1325 (Rev C; Notice 1; Canc. Notice 2) Beads
(Glass Spheres) Retro-Reflective (Metric)

FS TT-P-1952 (Rev D; Canc. Notice 1) Paint, Traffic and
Airfield Marking, Waterborne (Metric)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment; FIO

Lists of proposed equipment, including descriptive data, and

notifications of proposed Contractor actions as specified in this section. List of removal equipment shall include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation.

Composition Requirements; FIO

Manufacturer's current printed product description and Material Safety Data Sheets (MSDS) for each type paint/color proposed for use.

Qualifications; FIO

Document certifying that personnel are qualified for equipment operation and handling of chemicals.

SD-06 Test Reports

Sampling and Testing; FIO

Certified copies of the test reports, prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory.

SD-07 Certificates

Volatile Organic Compound (VOC); FIO

Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.

1.3 DELIVERY AND STORAGE

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

1.4 EQUIPMENT

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Equipment operating on roads and runways shall display low speed traffic markings and traffic warning lights.

1.4.1 Paint Application Equipment

The equipment to apply paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The machine shall have a speed during application not less than 5 mph, and shall be capable of applying the stripe widths indicated, at the paint coverage rate specified in paragraph APPLICATION, and of even uniform thickness with clear-cut edges. Equipment used for marking aircraft apron and road shall be capable of placing the prescribed number of lines at a single pass as solid lines, intermittent lines or a combination of solid

and intermittent lines using a maximum of two different colors of paint as specified. The equipment used to apply the paint binder to airfield pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with an arrangement of atomizing nozzles capable of applying a line width at any one time in multiples of 6 inches, from 6 inches to 36 inches.

The paint applicator shall have paint reservoirs or tanks of sufficient capacity and suitable gauges to apply paint in accordance with requirements specified. Tanks shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gauges in full view and reach of the operator. Paint strainers shall be installed in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

1.4.2 Reflective Media Dispenser

The dispenser for applying the reflective media shall be attached to the paint dispenser and shall operate automatically and simultaneously with the applicator through the same control mechanism. The dispenser shall be capable of adjustment and designed to provide uniform flow of reflective media over the full length and width of the stripe at the rate of coverage specified in paragraph APPLICATION, at all operating speeds of the applicator to which it is attached.

1.4.3 Preformed Tape Application Equipment

Mechanical application equipment shall be used for the placement of preformed marking tape. Mechanical application equipment shall be defined as a mobile pavement marking machine specifically designed for use in applying precoated, pressure-sensitive pavement marking tape of varying widths, up to 12 inches. The applicator shall be equipped with rollers, or other suitable compactive device, to provide initial adhesion of the preformed, pressure-sensitive marking tape with the pavement surface. Additional hand-operated rollers shall be used as required to properly seat the thermoplastic tape.

1.4.4 Surface Preparation Equipment

1.4.4.1 Waterblast Equipment

The water pressure shall be specified at 2600 psi at 140 degrees F in order to adequately clean the surfaces to be marked.

1.4.5 Marking Removal Equipment

Equipment shall be mounted on rubber tires and shall be capable of removing markings from the pavement without damaging the pavement surface or joint sealant. Waterblasting equipment shall be capable of producing an adjustable, pressurized stream of water. Sandblasting equipment shall include an air compressor, hoses, and nozzles. The compressor shall be equipped with traps to maintain the air free of oil and water.

1.4.5.1 Shotblasting Equipment

Shotblasting equipment shall be capable of producing an adjustable depth of

removal of marking and pavement. Each unit shall be self-cleaning and self-contained, shall be able to confine dust and debris from the operation, and shall be capable of recycling the abrasive for reuse.

1.4.5.2 Chemical Equipment

Chemical equipment shall be capable of application and removal of chemicals from the pavement surface, and shall leave only non-toxic biodegradeable residue.

1.4.6 Aircraft (West Parking Apron)Traffic Controls

Suitable warning signs and barricades shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

1.5 HAND-OPERATED, PUSH-TYPE MACHINES

All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces will be acceptable for marking small streets and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

1.6 MAINTENANCE OF TRAFFIC

1.6.1 Airfield

The performance of work in the controlled zones of airfields shall be coordinated with the Contracting Officer and with the Flight Operations Officer. Verbal communications shall be maintained with the control tower before and during work in the controlled zones of the airfield. The control tower shall be advised when the work is completed. A radio for this purpose [will be provided by the Government] [shall be provided by the Contractor and approved by the Contracting Officer].

1.6.2 Flightline Roads, Streets, and Parking Areas

When traffic must be rerouted or controlled to accomplish the work, the necessary warning signs, flagpersons, and related equipment for the safe passage of vehicles shall be provided.

1.7 WEATHER LIMITATIONS FOR REMOVAL

Pavement surface shall be free of snow, ice, or slush. Surface temperature shall be at least 40 degrees F and rising at the beginning of operations, except those involving shot or sand blasting. Operation shall cease during thunderstorms. Operation shall cease during rainfall, except for waterblasting and removal of previously applied chemicals. Waterblasting shall cease where surface water accumulation alters the effectiveness of material removal.

PART 2 PRODUCTS

2.1 PAINT

The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paints for airfields, roads, and streets shall conform to FS TT-P-1952, color as selected by Base Operations at LAFB. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

2.2 PREFORMED TAPE

The preformed tape shall be an adherent reflectorized strip in accordance with ASTM D 4505 Type I or IV, Class optional.

2.3 REFLECTIVE MEDIA

Reflective media for airfields shall conform to FS TT-B-1325, Type I, Gradation A. Reflective media for roads and streets shall conform to FS TT-B-1325, Type I, Gradation A or AASHTO M 247, Type I.

2.4 SAMPLING AND TESTING

Materials proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at source of supply, sufficiently in advance of needs to allow 60 days for testing. Upon notification by the Contractor that the material is at the site or source of supply, a sample shall be taken by random selection from sealed containers by the Contractor in the presence of a representative of the Contracting Officer. Samples shall be clearly identified by designated name, specification number, batch number, manufacturer's formulation number, project contract number, intended use, and quantity involved. [Materials will be sampled and tested by the Government. No material shall be used at the project prior to receipt by the Contractor of written notice that the materials meet the laboratory requirements. The cost of initial testing of samples from each lot of materials will be borne by the Government. If the sample fails to meet specification requirements, the material represented by the sample shall be replaced and the new material will be tested. Cost of sampling and testing the new material will be borne by the Contractor.] [Testing shall be performed in an approved independent laboratory. If materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the material appear defective during or after application.]

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surfaces to be marked and painted shall be thoroughly cleaned before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical

abrasion as directed. Areas of old pavement affected with oil or grease shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain.

3.1.1 Pretreatment for Early Painting

Where early painting is required on rigid pavements, a pretreatment with an aqueous solution containing 3 percent phosphoric acid and 2 percent zinc chloride shall be applied to prepared pavement areas prior to painting.

3.1.2 Cleaning Existing Pavement Markings

In general, markings shall not be placed over existing pavement marking patterns. Existing pavement markings, which are in good condition but interfere or conflict with the newly applied marking patterns, shall be removed. Deteriorated or obscured markings that are not misleading or confusing or interfere with the adhesion of the new marking material do not require removal. New preformed and thermoplastic pavement markings shall not be applied over existing preformed or thermoplastic markings. Whenever grinding, scraping, sandblasting or other operations are performed the work must be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. When these operations are completed the pavement surface shall be blown off with compressed air to remove residue and debris resulting from the cleaning work.

3.1.3 Cleaning Concrete Curing Compounds

On new Portland cement concrete pavements, cleaning operations shall not begin until a minimum of 30 days after the placement of concrete. All new concrete pavements shall be cleaned by either sandblasting or water blasting. When water blasting is performed, thermoplastic and preformed markings shall be applied no sooner than 24 hours after the blasting has been completed. The extent of the blasting work shall be to clean and prepare the concrete surface as follows:

a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.

b. There are no heavy puddled deposits of curing compound in the valleys of the textured concrete surface.

c. All remaining curing compound is intact; all loose and flaking material is removed.

d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.

e. The surface to be marked is dry.

3.2 APPLICATION

All pavement markings and patterns shall be placed as shown on the plans.

3.2.1 Paint

Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint.

Paint shall be applied pneumatically with approved equipment at rate of coverage specified. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

3.2.1.1 Rate of Application

a. Reflective Markings: Pigmented binder shall be applied evenly to the pavement area to be coated at a rate of 105 plus or minus 5 square feet per gallon. Glass spheres shall be applied uniformly to the wet paint [on airfield pavement at a rate of 8] [on road and street pavement at a rate of 6] plus or minus 0.5 pounds of glass spheres per gallon of paint.

b. Nonreflective Markings: Paint shall be applied evenly to the pavement surface to be coated at a rate of 105 plus or minus 5 square feet per gallon.

3.2.1.2 Drying

The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

3.2.2 Reflective Media

Application of reflective media shall immediately follow application of pigmented binder. Drop-on application of glass spheres shall be accomplished to insure that reflective media is evenly distributed at the specified rate of coverage. Should there be malfunction of either paint applicator or reflective media dispenser, operations shall be discontinued immediately until deficiency is corrected.

3.3 MARKING REMOVAL

Pavement marking, including plastic tape, shall be removed in the areas shown on the drawings. Removal of marking shall be as complete as possible without damage to the surface. Aggregate shall not be exposed by the removal process. After the markings are removed, the cleaned pavement surfaces shall exhibit adequate texture for remarking as specified in paragraph SURFACE PREPARATION. Contractor shall demonstrate removal of pavement marking in an area designated by the Contracting Officer. The demonstration area will become the standard for the remainder of the work.

3.3.1 Equipment Operation

Equipment shall be controlled and operated to remove markings from the pavement surface, prevent dilution or removal of binder from underlying pavement, and prevent emission of blue smoke from asphalt or tar surfaces.

3.3.2 Cleanup and Waste Disposal

The worksite shall be kept clean of debris and waste from the removal operations. Cleanup shall immediately follow removal operations in areas subject to air traffic. Debris shall be disposed of at approved sites.

3.4 Painting of ACC

Painting of ACC Unit logo and red carpet area shall be in accordance with requirements of Air Combat Command and shall be accomplished by others under separate contract. Dimensional configurations, paint color schemes shall be as directed by Air Combat Command Contractor to provide all materials, equipment and labor.

-- End of Section --